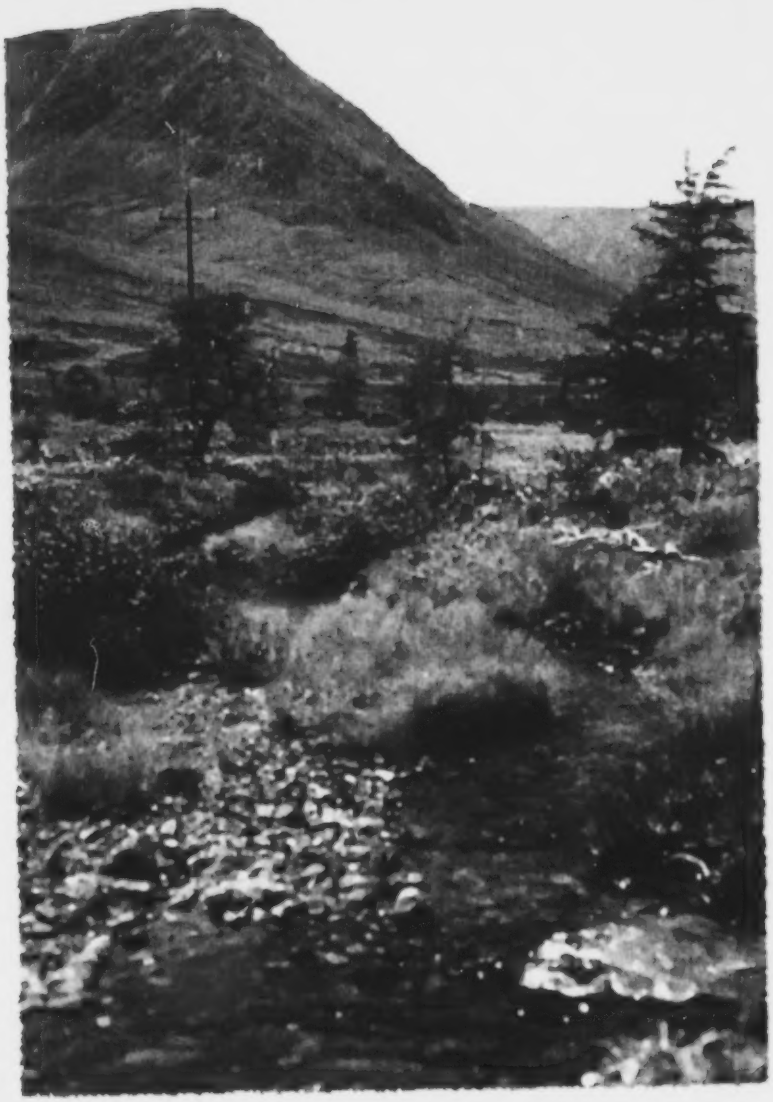
Natural Resources Canada | Ressources naturelles Canada



Earth Sciences Sector
Business Plan 2000/2003

Canada

Earth Sciences Sector
Business Plan
2000/2003

104-03027/

Earth Science Sector Business Plan 2000

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Publishing date: April 2000

Ce document est aussi disponible en français.

Earth Sciences Sector Success Stories

- With $1 million in supplementary funding from Natural Resources Canada in 1999/2000, the Polar Continental Shelf Project (PCSP) delivered coordinated, cost-effective, cost-shared logistical services to 142 client groups. These groups included federal and territorial governments, resource co-management agencies, northern communities and university Arctic research programs. PCSP's services supported work on sustainable resource development, environmental assessment and protection, climate change and traditional knowledge. In extending logistical support to a wide range of science research client groups, PCSP procured $2.7-million worth of products and services from Aboriginal suppliers during its 1999 Arctic field season. Also in 1999, PCSP developed the Inventory of Science and Technology Facilities in Canada's North as an online information tool for Canadian and international research scientists wishing to work in the Canadian Arctic.

- The Geological Survey of Canada (GSC) published an issue of GSC Bulletins on Canadian gold fields entitled Geological Classification of Canadian Gold Deposits. This publication presents the results of numerous years of study, undertaken in Canada and abroad, and distinguishes different types of gold formations on the basis of their geological characteristics. This classification helps the mining sector evaluate resources, develop exploration programs and evaluate regions of interest. Equally, it can serve as a guide in the search for new exploration targets in regions already explored.
- In July 1999, the Geological Survey of Canada (GSC) released the scientific results of a major gas hydrate research project it conducted in collaboration with the Japan National Oil Company. With the participation of the Japan Petroleum Exploration Company, the U.S. Geological Survey, and various other institutes and universities in Japan and North America, the GSC coordinated the release of an issue of GSC Bulletins consisting of 32 papers with 60 contributing authors. The Mallik 2L-38 gas hydrate research well, drilled in 1998, was the first scientific investigation of an Arctic gas hydrate accumulation that included the collection of gas hydrate core samples and an extensive s[illegible]ntific program. The results of the research were extensively profiled in the media and formed the basis o[illegible]pecial session at an international gas hydrate symposium in Japan. The GSC recently participated in the drilling of an offshore exploration well in the Nankai Trough area, off Japan's southeast coast. Japan's Ministry of Industry and Technology sponsored the drilling of the Nankai well. The project is considered a milestone since it is the first offshore gas hydrate exploration well in the world and the drilling took place under 950 m of water. GSC scientists, who were the only international scientists invited to participate in the Nankai well, provided expertise on gas hydrate coring, the interpretation of the geologic setting of the gas hydrate deposits, and the processing of high-resolution seismic data, used in part to select the drill site.

- The Geological Survey of Canada has secured funding of $1 million over four years as part of the Canada–Manitoba Flood Protection Program, a program established in response to the disastrous flooding of the Red River in southern Manitoba in 1997. These funds will be used to develop a comprehensive geoscience knowledge base about the Red River. One of the aims of this research is to determine the long-term frequency of flood events. Partners involved in this project include the Manitoba Geological Services Branch, Manitoba Water Resources, the University of Winnipeg, the University of Manitoba, Simon Fraser University, and the Department of Fisheries and Oceans.
- A Canadian consortium—led by the Canadian Centre for Marine Communications, with participation from the Geological Survey of Canada Atlantic, the Canadian Hydrographic Service, and the Ocean Mapping Group of the University of New Brunswick—was awarded a three-year contract to be the external scientific consultant for a Geological Survey of Ireland project to map the entire offshore of Ireland. The project is valued at over $40 million. The Canadian consortium participated in two project meetings, designed the survey, provided the equipment specifications and made recommendations on training. Canadian industry will have several opportunities to get involved in subsequent phases of this seven-year project. The awarding of the consulting contract to a Canadian consortium clearly highlights Canada's international reputation for this kind of project.
- The latest addition to a growing list of industry partners in the Central Foreland project of the National Geoscience Mapping Program is Wascana Energy Inc., which has signed an agreement to collaborate on fieldwork in the Fort Liard area of the Yukon and Northwest Territories. Wascana geologists will join the Central Foreland field party during mapping operations in the Fort Liard and La Biche River areas this year. The Wascana agreement reflects the increasing intensity of industry attention to the Fort Liard area where, in May 1999, Chevron Canada Resources and its partners drilled a successful well that was touted as one of the five most productive gas wells in Canada. Also last spring, drilling resulted in two other major discoveries in the same area. The ongoing support of industrial partners such as Wascana reflects their recognition of the valuable contribution of the Geological Survey of Canada, Calgary's science program to the economic development of western Canada.
- The Centre for Topographic Information (CTI) is completing the biggest international project ever undertaken by the Mapping Services Branch: producing 900 maps for the City of Riyadh in the Kingdom of Saudi Arabia. This three-year digital mapping project was carried out in partnership with Terra Surveys Ltd. and the Canadian Commercial Corporation.
- Geomatics Canada, together with the Geological Survey of Canada (GSC), has supported the establishment of the new territory of Nunavut. The GSC, in partnership with the Nunavut Department of Sustainable Development and Indian and Northern Affairs Canada, has established the Canada–Nunavut Geoscience Office (C-NGO) in Iqaluit. Natural Resources Canada Minister Ralph Goodale officially opened the office in September 1999. The C-NGO mandate is to provide accessible geoscience information and expertise in Nunavut to support sustainable development, education and training, awareness and outreach, and capacity building. C-NGO, led by Chief Geologist David Scott of GSC, will be fully staffed and operational before new integrated geoscience programs begin in summer 2000. Geomatics Canada's Legal Surveys Division has established the Nunavut Client Liaison Unit to provide cadastral survey services throughout the territory. In accordance with its capacity building and Aboriginal hiring strategies, the Division hired Inuit employees for two of the three available positions.

- The Cartographic Services Section of the Geoscience Information Division, Earth Sciences Sector, has recently obtained ISO certification. The Section produces digital, multicolour geological maps for on-demand and offset printing, as well as related graphics for the Geological Survey of Canada's (GSC's) scientific publications. It provides digital imaging services to GSC and technical photographic services to the Earth Sciences Sector. The ISO certification represents a major achievement in process improvement, product improvement and accountability. It is also an important step towards maintaining and improving both service to clients and focus on employees. The Section achieved ISO certification three months ahead of the scheduled implementation date.
- In 1999, the Centre for Topographic Information (CTI) did research into maps for blind and visually impaired people. High-quality tactile maps can be produced using a special raised-ink powder invented in Canada. CTI has also enhanced tactile maps by adding multimedia technologies, such as voice capability. A map of Ottawa was presented at an Industry Canada trade show on Canadian Technologies for the Disabled and was tested in schools for the blind. As a result of these demonstrations, the W. Ross McDonald School for the Blind and Visually Impaired in Brantford, Ontario ordered atlases from CTI.
- The Geodetic Survey Division (GSD) has a proud history. GSD has carried out its mandate and served Canada for 90 years by developing a national framework for horizontal positions and elevations. Today, it uses satellite observations, interferometric radio astronomy and gravity observations, complemented by computer modelling, to achieve its mandate. An Order-in-Council officially proclaimed the formation of GSD—then known as the Geodetic Survey of Canada—as part of the Dominion Observatory on April 20, 1909. The Dominion Observatory made its first precise gravity measurements in 1902 in Ottawa, Toronto, and Montreal followed by the first Canadian triangulation station being constructed in 1906 at King Mountain, near Kingsmere, Quebec. The first benchmark for elevations was also established in 1906 at Sherbrooke, Quebec. Today, GSD is collaborating with provincial, federal and territorial agencies to distribute GPS Corrections (GPS•C), a service that provides direct real-time access to national positioning standards. From classical networks to satellites and quasars, GSD continues to provide the Canadian Spatial Reference System as an infrastructure of Canada's knowledge-based society—the evolution of a 90-year tradition.
- Canada Centre for Remote Sensing (CCRS) scientist Thierry Toutin has been awarded a "Prix d'Excellence" from Federal Partners in Technology Transfer for his collaborative R&D work over the past seven years with PCI, a major Canadian geographic information system software vendor. This collaborative work has led to significant commercial advancements in three-dimensional (3-D) viewing, image processing and feature extraction. The commercial product they developed represents a revolutionary advance in generating and using 3-D images of the earth. Since the beginning of this collaboration, PCI has sold more than 1200 software licences in 60 countries and generated over $3 million in sales. Income from the 3-D software now represents about 10 percent of the company's revenue and has created six new positions at PCI. These sales have also translated into a healthy return to CCRS in the form of royalties.

- For the past two years, Canada Centre for Remote Sensing (CCRS) scientists have worked with the Innu First Nation to develop baseline ecological surveys of lands important to the Innu way of life. Through the CCRS Local Environment Applications Program, Innu elders and CCRS scientists have pursued ways to incorporate Innu knowledge and perspectives into science-based research, including research into ethical, intellectual and property issues. In 1999, fieldwork in the forest and wetlands around Sheshatshui in Labrador was completed using RADARSAT and airborne hyperspectral imager data. The Innu leadership has asked for meetings in 2001 to determine follow-up work, primarily work related to hydroelectric development in the Lower Churchill River.
- Successful management of Canada's ocean regions requires geoscience information about the seafloor. By applying its multi-beam bathymetric data expertise in habitat mapping, the GSC is working with the Department of Fisheries and Oceans, the Canadian Hydrographic Service and the fishing industry to deliver seafloor maps suitable for fisheries habitat management, commercial fishing, geological mapping and navigational charting. Seafloor geological interpretations are integrated with biological information to provide useful information for informed decision-making about the future use of ocean resources. This information is also used to make decisions about how to minimize the impact of fishing in areas important to the scallop industry and areas where fishing gear damage is a significant problem for scallop draggers.

Natural Resources Canada

NRCan Business

NRCan advances the development of Canada's economy by providing expert scientific and economic knowledge to Canadians, and by promoting the sustainable development and use of Canada's natural resources and the competitiveness of the energy, forest, mining, geomatic and geoscience sectors. It is committed to good governance, to the delivery of high-quality products and services, to the protection of Canadians' health and safety, and to partnerships with private and public sector organizations.

Operating Principles

NRCan has adopted operating principles to define the business standards, beliefs and values of the organization, and the goals it is trying to achieve. The Earth Sciences Sector employs these principles to guide its day-to-day activities and to sharpen the focus of its plans and priorities.

Respect, honesty, equity, fairness and integrity are the basis of our relationship with Canadian citizens, our clients and each other. We value the commitment and dedication of the people who form our organization and subscribe to the following beliefs.

Strong Leadership is Essential

We value leadership that provides a vision of the future and creates an environment of trust and respect. By example and involvement, leadership demonstrates a clear sense of direction, fosters teamwork, is accountable, and motivates and supports our organization in reaching its objectives.

People are Our Principal Strength

We work in a challenging and healthy environment that enables us to achieve our work goals and reach our full potential. We have the tools and opportunities to acquire the skills and expertise to perform our jobs; we are encouraged to be innovative; and we are recognized for our achievements.

Mission

Natural Resources Canada provides the knowledge and expertise for the sustainable development and use of Canada's natural resources and the global competitiveness of resources and related sectors for the well-being of present and future generations.

A Vision for Canada's Natural Resources Sector

As we enter the new millennium, Canada must become and remain the world's "smartest" natural resources steward, developer, user and exporter—the most high-tech, the most environmentally friendly, the most socially responsible, the most productive and competitive —leading the world as a living model of sustainable development.

Effective Planning Helps Us to Improve

We believe that planning for improvement is key to our ability to manage effectively and to measure performance and the impact of our activities.

Through continuous learning and improvement, measurement and evaluation, we deliver efficient and relevant programs that support government priorities and objectives and meet the needs of our clients and stakeholders.

Creativity and Innovation are Key to Our Future

We value and support creativity and innovation in the development of leading-edge science and technology, policies and programs, better internal practices and improved service delivery. Creative thinking and innovative solutions can help us meet the challenges we face.

The Canadian Public Interest is Paramount

We help our minister, under law and the Constitution, to serve the public good and to enhance the economic, social and environmental well-being of Canada.

Quality Service to Clients is Our Standard

We incorporate a strong focus in all our activities by consulting with our clients and stakeholders to ensure that we understand their needs and expectations and that our programs are relevant and useful. In delivering the best value for funds entrusted to us, we seek excellence in our products and services.

Effective Communication is a Shared Responsibility

We create an environment that encourages the sharing of timely information throughout our organization and with clients and stakeholders, and provide the means for open, honest and transparent communication. Collectively and individually, we demonstrate our value and contribution to Canadian society.

Cooperation is the Foundation of Our Success

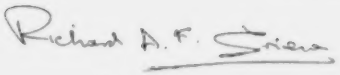
We believe cooperation to be the foundation for meeting the challenges of the future. Through partnerships, teamwork and strategic alliances, we work together toward common goals, both within and outside the organization.

Earth Sciences Sector Management Team

Earth Sciences Sector Mission

The Earth Sciences Sector will provide innovative, timely and reliable geomatics and geoscience knowledge, advice, products and services to meet client needs.

Marc Denis Everell
Assistant Deputy Minister
Earth Sciences Sector



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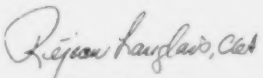

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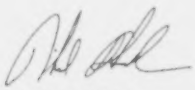

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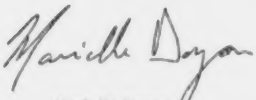

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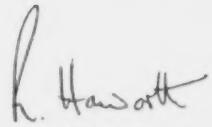

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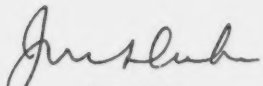

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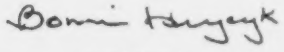

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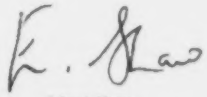

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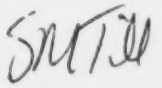

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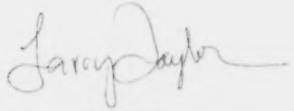


Larry Taylor
Quality Management Advisor

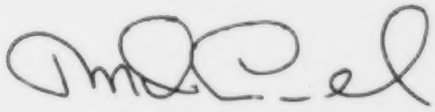
Message from the Assistant Deputy Minister

I am pleased to introduce the 2000/2003 Business Plan for the Earth Sciences Sector. It provides details of the services and products that we will deliver to government, industry, universities and the general public over the next three years.

As the Sector moves into its fifth year, its component organizations—the Geological Survey of Canada, Geomatics Canada and the Polar Continental Shelf Project—are developing a unified vision of the contribution that they make to Canadian society and the Canadian economy. This vision is one of providing a unique and authoritative centre of expertise for Canadian geoscience and geospatial data and knowledge. Using the Internet, the Sector is moving rapidly to provide access to a national geospatial knowledge base that I believe is essential to all aspects of the sustainable development of Canada's natural resources and the wise use of its landmass and offshore areas.

In fall 1999, the Earth Sciences Sector issued a five-year strategic plan that will move the Sector toward this goal and that outlines the context and intent for the actions in this business plan. The Strategic Plan shows how the Sector intends to focus and develop its programs and, in particular, how it will ensure that it can deliver them.

As I said in my introductions to previous editions of the Business Plan, the activities of the Sector and the goals of Natural Resources Canada are fully aligned. As the Plan continues to evolve in structure and format, it is my hope that this alignment remains clear and understandable to the reader. Whether staff, client or stakeholder, it is important that you understand what we intend to deliver, and why we believe Canada and Canadians need it.



Marc Denis Everell
Assistant Deputy Minister
Earth Sciences Sector

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1 Earth Sciences Sector: The Context

The Earth Sciences Sector (ESS) Business Plan is one in a series of Natural Resources Canada (NRCan) planning documents. The series also includes the NRCan Strategic Issues Letter, the NRCan Report on Plans and Priorities, and ESS branch, centre and division business plans. These plans are linked by reference to a set of common departmental goals.

ESS, which represents approximately 35 percent of the total resource allocation of NRCan, comprises the Geological Survey of Canada (GSC), Polar Continental Shelf Project (PCSP) and Geomatics Canada (GC). As a predominantly science and technology-based Sector of NRCan, ESS is the principal national agency for earth science knowledge and innovation. The GSC is a major contributor to the comprehensive geoscience knowledge base of Canada. GC provides a reliable system of surveys, spatial referencing, maps, remotely sensed data and geographically referenced information describing the Canadian landmass. PCSP helps Canada exercise its sovereignty over its Arctic regions by providing comprehensive, coordinated logistics support to northern scientific research programs.

Introduction

In its Science, Technology and Industry Outlook 1998, the Organisation for Economic Cooperation and Development (OECD) indicated four key forces driving long-term change in OECD economies:

- technological change;
- globalization;
- changing lifestyle and demand patterns; and
- threats to the global environment.

All sectors of society—government, industry and individuals—have felt the impact of rapid technological change, which has profoundly influenced the relationships among them. The growth of computer and information technologies has revolutionized information exchange and the way organizations conduct business. The use of e-commerce is expected to grow exponentially, and both governments and the private sector are rapidly establishing policy and business frameworks to adapt to and enable this growth.

Globalization has reduced trade barriers and fostered the emergence of regional trade alliances, such as the North American Free Trade Agreement and the European Union. This closer integration and interdependence does, however, render countries more vulnerable to economic crises and loss of macro-economic autonomy. Governments, particularly Canada's, have responded with more conservative fiscal policies to reduce the impact of any future crisis on their economy.

Globalization also places pressure on countries to become more competitive, innovative and productive. As a result, the Canadian government has focused on increasing its science and technology (S&T) capacity by supporting research and development in science departments, industry and academia. Partnerships, cooperative ventures and innovative financing arrangements have all been used to help meet the demand.

Finally, environmental issues such as climate change and the long-range transport of pollution are international concerns. In this respect, science and technology contribute to the understanding of the natural world and the impact of human activity.

Canadians are aware of all these issues and are becoming more involved in decision-making and policy development related to their land and resources than ever before. Canadians are demanding more geo-information as technology and government service delivery evolve to support increased citizen involvement.

These changes are bringing about a shift in the organizational culture of ESS. Instead of focusing on serving the scientific and technical community, it is focusing on serving a much broader, less expert client base. ESS must continue to rapidly expand its technologies for acquiring, managing, analyzing and disseminating earth science information through the Internet and other media.

Update on Government Priorities

Powerful forces are reshaping the global economy. Rapid technological innovation is transforming the skills and knowledge required to compete domestically and abroad. At the same time, the world is becoming smaller as goods, services and workers move across borders more swiftly and freely than ever before.

In the modern economy, individuals and businesses must move quickly to seize the opportunities created by globalization and advances in technology. Competitiveness is becoming more dependent on the ability to create new products and put innovative technologies to work. Developing a highly skilled workforce, therefore, is crucial.

The Government of Canada has a key role to play in this process by promoting access to knowledge and skills, and by expanding the capacity of businesses to innovate. A key goal of the federal government has been to build a strong economy—one that generates well-paying jobs and a higher standard of living for all Canadians. Over the past five years, the government has taken meaningful steps towards this goal by encouraging strong growth in productivity. However, no single policy measure will guarantee stronger performance in the future. As a result, the government has taken several actions, including restoring fiscal balance.

There is more to productivity growth than sound fiscal management, tax relief and overall business confidence. In today's economy, investment in knowledge and innovation is crucial. To compete successfully in the global marketplace, firms must continually innovate. This is essential not only in high-tech companies, but in all sectors.

To create new technologies and develop new products and processes, industry needs people who have leading-edge research skills and know how to put new technology to work.

Government Priorities: Fall 1999

Due to efforts over the last several years, Canada is now entering a new era of fiscal flexibility that will give the government greater scope to make sound economic and social investments.

On October 12, 1999, in the Speech from the Throne, the Governor General described the government's priorities and commitments for the rest of its mandate. She laid out a vision for improving Canadians' quality of life through collaboration with provinces, territories and other partners to address areas of critical importance. The Speech presented a comprehensive strategy for achieving a higher quality of life by accelerating the transition to the knowledge-based economy, promoting our interests and projecting our values to the world.

The Speech positioned Canada to continue benefiting from its balanced fiscal management approach and committed the government to focusing on the following priorities:

- developing programs for children and youth;
- building a dynamic economy;
- strengthening health care for Canadians;
- ensuring the quality of the environment;
- building stronger communities;
- strengthening the relationship with Aboriginal peoples; and
- advancing Canada's place in the world.

The Speech from the Throne stated that, "In the global knowledge-based economy, the advantage goes to countries that are innovative, have high levels of productivity, quickly adopt the latest technology, invest in skills development for their citizens, and seek out new opportunities around the world." Significantly for NRCan, the Speech highlighted the government's plan to "support innovation and development of new technologies in leading export sectors such as agriculture, agri-food and natural resources". The Speech also projected that, by 2004, Canada would be known around the world as "the government most connected to its citizens".

Many aspects of the Speech from the Throne have implications for both NRCan and ESS. These include commitments to innovation, environmental technology and stewardship, skills development, rural communities and regions, and e-commerce. As well, the Speech outlined an increased emphasis on preserving the quality of the environment. It reaffirmed the government's intent to meet Canada's commitments under the Kyoto Protocol on global climate change, and indicated that the government will make decisions using an integrated sustainable development approach.

As part of the strategy to build a dynamic economy for the 21st century, the government "will ensure that it has a modern and effective research and science capacity to promote the health, safety and economic well-being of Canadians". The Speech from the Throne also made a commitment to strengthening the government's capacity for environmental research and Canada's capacity for climate change research. In addition, the Speech committed the government to focusing on the recruitment, retention and continuous learning of a skilled federal workforce.

The theme of using knowledge and innovation to spur productivity and to enhance Canadians' quality of life was further emphasized in the November 1999 Economic and Fiscal Update, *Translating Better Finances into Better Lives*. In this update, the government committed itself to a multi-faceted plan to ensure Canadians live better lives in the new economy of the 21st century. The Fiscal Update laid out four key elements of this plan:

- continuing to provide sound financial management;
- promoting economic growth and a better quality of life by reducing taxes;
- making the economy more competitive through innovation; and
- giving Canadians security and opportunity by helping them acquire education, knowledge and skills.

The Fiscal Update noted that the economies that will thrive in the next decade will be those that excel at innovation. In this respect, the government acknowledges the importance of continuing to support groundbreaking research and development (R&D) that provides innovative ideas and methods, and in turn generates continued economic growth. Furthermore, the Fiscal Update noted that investing in skills and knowledge by supporting advanced research and innovation is an essential ingredient for a strong and flexible economy.

Highlights of the 1999 and 2000 Federal Budgets

The government has focused on laying the foundation for a stronger, more productive economy by investing in knowledge, innovation and people. The government's framework for innovation has four main thrusts: creating knowledge; disseminating and sharing knowledge; commercializing knowledge; and supporting employment. Economic growth in Canada will be possible only with a foundation of sound social policies. Government will continue to pursue its priorities by closely integrating both social and economic programs, in partnership with the provinces and territories.

Highlights for ESS in the 1999 Federal Budget included $60 million funding over five years for GeoConnections and long-term funding for the Canada Space Plan. GeoConnections is a national partnership program that supports the government's efforts to make knowledge accessible to Canadians on the information highway. Not only does GeoConnections support the growth of Canada's geomatics industry, it is a 21st-century tool for nation building—providing a unique opportunity to bring together all levels of government, the private sector and academia. As stated in the 1999 budget speech, "The goal of this initiative is to develop and make available—through the information highway—comprehensive and integrated data about Canada's geography, environment, people and resources. Information will be categorized by geographic location to give users a detailed and timely profile of the physical, demographic and economic characteristics of any given region. In addition to keeping Canada at the forefront of mapping, GeoConnections will have applications in areas ranging from climate change monitoring to business development."

The 1999 Budget gave the Canadian Space Agency an additional investment of $430 million over three years, and ongoing stable funding of $300 million annually, starting in 2002/2003. Priorities of the Canada Space Program include satellite observation of the earth for environmental monitoring and resource management purposes. This task includes collecting and disseminating space data for forest monitoring and climate change research. The Canadian Space Agency has helped Canadian space technology firms succeed in such fields as space robotics, earth observation, science and satellite communications.

In the 2000 Budget, the government has built a solid foundation for a stronger, more productive economy by focusing on five themes: economic development and prospects, sound financial management, tax reduction, innovation and improved quality of life. As Finance Minister Paul Martin said in his budget speech on February 28, 2000, "Governments must provide the right economic, social and regulatory framework within which innovation can occur. Governments also need to ensure that opportunities exist for all citizens to have access to education, skills and knowledge, and that the benefits of innovation are widely shared."

Building on the theme of "A More Innovative Economy," the 2000 Budget increases the government's support for research. The Budget will also encourage the growth of Canada's knowledge-based economy by accelerating the provision of government information and services over the Internet to all Canadians.

To ensure that Canada's geological information infrastructure remains "state-of-the art," and as part of the government's commitment to investing in research and innovation, the 2000 Budget provided $5 million a year for three years for geoscience. This initiative is designed to stimulate new investment in the mining sector by improving the quality of information relevant to new mining opportunities. The initiative, described as the Targeted Geoscience Initiative, is part of the Resource Innovation Action Plan (RIAP) of the Minister's Forward Agenda. Its objective is to allow all regions of the country to benefit from undiscovered resources. The funding will be used primarily for cooperative regional geoscience and information management to promote mining investment.

The Budget also confirmed that the government is providing an additional $210 million over three years, beginning in 2001/2002, to renew the Climate Change Action Fund and various energy efficiency and renewable energy programs. This renewal will help the Sector further our understanding of climate change and of ways we can adapt to it.

The Budget also reiterated the government's ongoing support for academic research to address the impact of climate change. The Budget provides $60 million to fund the creation of the Canadian Foundation for Climate and Atmospheric Sciences. The Foundation will provide research grants to teams of Canadian scientists over the next six years.

Public Sector Management Priorities

The past five years have seen dramatic and fundamental change in government and public sector management priorities. Important changes include realigning the role of government through such initiatives as Program Review and the Social Union Framework Accord; regaining our fiscal sovereignty; focusing more on clients when delivering services; and developing policies in a more citizen-centered way. In addition, the public service has reframed the way it manages its human resources. It is now striving to create a suitable work environment for knowledge workers—a workplace that is both healthy and productive. Because it has eliminated the annual deficit, the government can reinvest strategically in both social and economic priorities.

In her sixth and final annual report to the Prime Minister on the Public Service of Canada, the former Clerk of the Privy Council, Jocelyn Bourgon, described exemplary public service practices and advances that reflected the following principal themes:

- building partnerships and teams by breaking down barriers (working horizontally);
- using the power of technology;
- strengthening policy capacity;
- promoting integrated policy advice; and
- renewing the public service by putting people first.

The new Clerk of the Privy Council, Mel Cappe, has remarked that evolving issues and a new, citizen-focused societal agenda will require government to work more closely with the provinces and territories, the private sector and civil society. The Clerk has identified an increasing need for government to share and broker knowledge, synthesize information and engage citizens.

Treasury Board of Canada, Secretariat (TBS) is advocating an approach to public policy based on values and results. This will help the government focus its service delivery on clients and help ensure that the government keeps citizens in mind when developing policies and generating knowledge. Additionally, TBS is continuously trying to help departments and agencies communicate with parliamentarians more effectively by improving annual plans and reports.

The Auditor General for Canada is looking for value for money, examining the effectiveness of horizontal file management, and ensuring the accountability and transparency of alternative service delivery and new governance arrangements. As well, the Auditor General has recently focused on the attributes of well-managed research organizations, highlighting the importance of key attributes, such as good project management and leadership.

Evolving Governance

Citizen-centered governance is an important element in an integrated and collaborative approach to policy development. Its success depends on active and meaningful public consultation and citizen engagement.

The future of governance and policy development rests on partnership and shared responsibility. Increasingly, the federal government is asking provinces, territories and Canadian citizens to help it make decisions about programs. Technological advances now allow Canadians to become more involved in making policies and decisions. This change—along with the expectation that the government should be more involved in areas such as environmental protection, climate change and sustaining resource-dependent communities—has broadened the client base of ESS.

The Canadian government has made a long-term commitment to Aboriginal peoples through *Gathering Strength: Canada's Aboriginal Action Plan*. The Action Plan has four objectives: renewing partnerships with Aboriginal people; strengthening Aboriginal governance; developing a new fiscal relationship; and supporting strong communities, people and economies by investing in health, public safety, education and economic development. This plan reaffirmed the government's commitment to building and strengthening partnerships with all Aboriginal peoples, including Métis and Inuit. Devolution, settlement of land claims, self-government agreements and recent court decisions—such as Delgamuukw and Marshall—will all have profound impacts on governance in Canada in the next decade.

The Canadian Rural Partnership, a four-year initiative announced in the 1998 Budget, has helped fund projects designed to develop rural communities. On the basis of input from citizens across the country, culminating in the National Rural Workshop in October 1998, the government tabled the new Federal Rural Policy in late 1998. This initiative coordinates the development of federal policies and programs that support rural communities. With representatives from more than 25 government departments and rural teams in each province and territory, the initiative directs funding to address rural development issues. The emphasis is on developing tools to enhance the quality of life in rural communities. To date, the initiative has funded several pilot projects supporting community-based projects.

The Yukon office of the Legal Surveys Division (LSD) recently obtained approval and funding from the Canadian Rural Partnership for a 12-month training program that brings together many partners: LSD, the Yukon Geology Program, Indian and Northern Affairs Canada's Forest Management Office, and the Renewable Resources Branch of the Government of the Yukon. The training program will be provided to two communities: the First Nation of Nacho Nyak Dun and the Teslin Tlingit Council. Program participants will learn about available information that will support planning and decision-making in rural Aboriginal communities throughout the Yukon. They will also be given the opportunity to work with several Yukon-based government agencies.

Natural Resources Canada: Priorities

The centrepiece of the 1999/2002 NRCan Strategic Plan is its action plan, *Winning in the Knowledge-based Economy* (WINS). This action plan describes the challenges NRCan must face to develop resources sustainably in Canada in the 21st century. These challenges include the following:

- addressing Canada's lagging productivity and innovation relative to its competitors;
- fostering competitive natural resources industries and the value-added sector in the knowledge-based, global marketplace;
- building capacity and creating work opportunities in rural, remote, northern and Aboriginal communities by providing access to government information and services through initiatives such as GeoConnections;
- implementing Canada's commitment to the Kyoto Protocol domestically by developing policies and technologies related to climate change and fostering related scientific research; and
- maintaining an investment climate and a national infrastructure, including accessible scientific knowledge and technology, that attract investment to the natural resources sector.

Sustainable development and good governance are guiding themes of WINS. This action plan builds on the full range of the department's responsibilities and includes initiatives that address key government priorities. Implementation of this action plan will help the government fulfill commitments mentioned in *Securing Our Future Together*, the Speech from the Throne and federal budgets. The WINS action plan focuses on the following five areas.

Tackling Climate Change

Canada has pledged to work with the world community to identify climate change problems and to advance solutions that fulfill international obligations without compromising economic growth. The Prime Minister has asked the Minister of Natural Resources to lead the domestic implementation of measures to address commitments Canada made in Kyoto in 1997. NRCan will work closely with other departments, the Climate Change Secretariat, provincial governments, industry and other stakeholders to accomplish this task. It will play a lead role in developing initiatives that will support Canada's commitments to reduce greenhouse gas emissions and help Canada adapt to the impacts of climate change.

The department provides knowledge and technical advice to industry and government. It is a recognized leader in energy efficiency, renewable energy, environmentally friendly technologies, forest management, and scientific assessment, monitoring and adaptation planning. NRCan's activities related to climate change will help lay the foundation for a national strategy to address climate change.

Spurring Innovation

The natural resources sector employs, directly and indirectly, more than 1.4 million Canadians in highly skilled, high-paying jobs. The sector is the mainstay of about 650 communities across Canada, contributes $88 billion to the gross domestic product, accounts for 11.4 percent of the total economy and adds $60 billion to the balance of trade. In the last two decades, the natural resources sector has transformed itself into one of the most productive sectors in the economy. Global competition remains intense and further innovation is required if the sector is to remain competitive.

Innovation in the natural resources sector faces some unique challenges. By fostering strategic alliances, catalyzing university research and contributing its own expertise, the federal government can play a pivotal role in spurring innovation. NRCan's Resource Innovation Initiative is addressing innovation barriers facing the natural resources sector through strategic S&T initiatives, a skills partnership with Human Resources Development Canada and its Sector Councils program, and information dissemination via GeoConnections and ResSources.

Promoting Resource Trade and Investment

Few sectors of the economy depend more on trade and investment than the natural resources sector and none contributes more to Canada's positive balance of trade. As the sector capitalizes on the opportunities of the knowledge-based economy, that contribution will increase. Canada has carved out niche markets in geomatics, geoscience and other resource-related industries. It is also a world leader in commercializing environmentally sound products and services. Canada's S&T infrastructure in natural resources furthers this competitive advantage.

NRCan promotes Canada's natural resources interests internationally. The department has contributed to the success of international trade missions and has led the way in promoting Canadian geomatics and geoscience expertise and services. NRCan's action plan is building on these efforts. The department participates in bilateral, regional and multilateral discussions to help create a business climate conducive to Canadian resource interests. It also helps Canada meet its global commitments by negotiating and participating in international protocols, trade agreements and policy initiatives.

Increasing Work Opportunities

The natural resources sector is a major employer, providing direct employment for 781,000 Canadians and supporting another 700,000 jobs in related industries. Its economic influence is widely distributed throughout the country. All regions—and especially rural, northern and Aboriginal communities—depend significantly on resource development.

NRCan works to strengthen the resource base in communities heavily reliant on natural resource development. The department has helped northern Aboriginal and other communities participate in resource sector opportunities through initiatives such as the Sustainable Communities Initiative. In collaboration with partners in other governments, NRCan is taking steps to further enhance community capacity.

Fostering National Consensus

Making Canada the world's smartest resource developer, user and exporter will require consensus on the role of natural resources in the country's economic and social life. NRCan has taken an active part in putting the first building blocks of this consensus in place. The department will continue to collaborate closely with partners and stakeholders to engage Canadians in this essential dialogue. Consensus on principles for sustainable natural resources development and use will become the basis for enhancing resource-based benefits and building new opportunities. As a result, Canada will continue to be seen as a world leader in the sustainable development of natural resources.

The Minister's Action Plan was extended in 1999 to include S&T and a broadened Resource Trade and Investment Initiative that includes a more proactive international business development strategy and full participation in Team Canada Inc. The Minister is also very committed to addressing regional issues in the context of NRCan's mandate and capabilities. ESS is responding to the department's priorities by leading on a number of initiatives, including the Resource Innovation Initiative, the Sustainable Communities Initiative, and the science, impacts and adaptation component of the Climate Change Initiative.

Earth Sciences Sector

Strategic Plan

To face challenges and capitalize on the opportunities presented by internal and external change, ESS has developed a roadmap for the future entitled *Strategic Directions for 2000-2005*. This strategic plan builds on the study done in 1998/1999 to examine the Sector's S&T capacity needs for the next decade. It presents a framework of goals, objectives and implementation strategies that are aligned with NRCan's long-term goals. This framework responds to government priorities and reflects the Sector's mandate. ESS will, if necessary, examine and adjust its implementation strategies to respond to resource requirements, evolving government priorities and client needs. As this is the Sector's first strategic plan, it presents a new vision for the future:

By 2005, ESS will be an international leader in the generation and provision of on-demand, easily accessible and integrated earth science knowledge and advice.

The Sector's goals are to

- provide geospatial and geoscientific knowledge on Canada for sound economic, environmental and social decisions;
- provide geospatial and geoscientific knowledge to help develop and sustain economic and social benefits;
- provide geospatial and geoscientific knowledge to minimize the impacts of land use, natural resource development and climate change;
- provide geospatial and geoscientific knowledge to enhance the safety and economic security of Canadians; and
- ensure that the Earth Sciences Sector is a forward-looking, rewarding, and effective and efficient workplace, and that it meets the needs of its clients.

The plan emphasizes integrated earth science contributions to strategic issues such as climate change, resource sector competitiveness, environmental and natural hazards monitoring, disaster information management and emergency response, and community capacity-building. ESS will achieve these goals and objectives by

- emphasizing multi-disciplinary research and the integration of data and information from different sources (including satellite and ground-based sources);
- providing Internet access to data, information and knowledge through GeoConnections and ResSources;
- contributing knowledge and information tools to support policy decisions;
- building new partnerships, networks and strategic alliances to better undertake S&T activities and deliver services; and
- promoting flexibility and synergy within ESS and building on the excellence of the staff.

The Sector will increase its activity in the following areas:

- providing integrated geospatial frameworks;
- enhancing management of and access to earth sciences knowledge;
- undertaking climate change science, impacts and adaptation research;
- establishing a national program in groundwater studies;
- building the capacity of rural, remote and Aboriginal communities; and
- safeguarding Canadians from natural hazards, and supporting emergency and disaster response efforts.

Since many of these activities will require increased resources, ESS will continue to seek new opportunities to increase its resources through partnerships, strategic alliances and new government initiatives.

The ESS strategic plan will help the Sector become an international leader in generating and providing on-demand, easily accessible and integrated earth science data, knowledge and advice. To achieve this vision, ESS will need to build internal and external synergies and partnerships, and move toward a broader model of shared leadership with the Canadian earth sciences community. Through its annual business plans, ESS will describe specific actions for the implementation strategies described in the Strategic Plan.

Science and Technology Agenda

The federal role in S&T policy is to provide leadership and to help Canadians move toward a knowledge-based economy. In 1996, the federal government published *Science and Technology for the New Century: A Federal Strategy*. This strategy recognizes that S&T plays a critical role in the health and well-being of Canadians, as well as in the country's ability to generate sustainable employment and economic growth. In this context, it outlines a strategic approach to developing S&T policies and programs through a national system of innovation and partnership.

There are a number of management challenges to ensuring that federal S&T meets government needs and moves in the directions outlined in the Federal Science and Technology Strategy. These include examining existing management practices; reviewing government capacities to deliver S&T; fostering collaboration and partnerships among government departments; and increasing the availability of information to Canadians. In December 1998, the Auditor General released a report that identified a number of areas where the government needed to make additional progress in implementing the Federal Science and Technology Strategy. These included effectively managing files that included several departments, such as climate change.

An important new component of the federal government's S&T community is the Committee of Science and Technology Advisors (CSTA), which comprises representatives from senior ministerial advisory boards. CSTA reports to the Cabinet Committee on the Economic Union through the Secretary of State for Science, Research and Development. In 1999/2000, CSTA examined the role of government in S&T, its capacity to deliver S&T and the issue of science advice to government. In 2000/2001, the government will take action on CSTA's two reports, *Science Advice for Government Effectiveness* and *Building Excellence in Science and Technology*.

Partnerships

To address today's increasingly complex issues, the national and international earth sciences community is developing more partnerships, networks and strategic alliances. ESS is continuing to develop multi-stakeholder relationships with the provinces and territories, universities and industry to deliver its programs through initiatives such as the Intergovernmental Geoscience Accord, and to disseminate its information through initiatives such as GeoConnections.

Few policy challenges or issues are solved unilaterally. Rather, interdepartmental and intergovernmental solutions are now the norm. In many cases, the parties involved need scientific evidence to make their decisions. ESS and other federal departments and agencies realize they need to work together to fulfill their mandates and to address science policy issues that cut across mandates, such as metals in the environment and climate change. In addition to cooperating with other organizations to deliver its mandate, ESS is involved in partnerships that help other departments and agencies to deliver their mandates, such as the Canada Space Plan and Red River Valley Flood Protection Program.

ESS has a strong record of supporting the development of earth sciences industries in the private sector. For many years, ESS contracts to industry for program delivery have stimulated growth in the private sector. International partnerships have also provided significant benefits for Canada, in terms of scientific knowledge, opportunities for Canadian businesses and involvement in the development of international standards.

In response to a number of funding pressures over the past five years, the level of intergovernmental cooperation, coordination and collaboration in program design and delivery has increased. In 1996, 10 out of 12 federal, provincial and territorial Mines Ministers signed the Intergovernmental Geoscience Accord to define the complementary roles and responsibilities of the different levels of government. This accord is coordinated through the National Geological Surveys Committee and does not yet include Quebec or P.E.I. The Canadian Council on Geomatics is the major federal, provincial and territorial consultative body for geographic information management. Together, these two bodies provide mechanisms for managing interdependence, shared goals, and responsibilities with the provinces and territories.

Market Opportunities

The Canadian earth sciences industry is currently facing one of the biggest opportunities in its history. Borders are opening to Canadian products and services, international demand for Canadian solutions is expanding and Canada's trade reputation is growing steadily. Canada has always been a significant global provider of natural resources. For many years, it has also been regarded as a leader in providing geomatics and geoscience consulting expertise. Canada is well positioned to take advantage of significant new opportunities in international markets for earth sciences knowledge and abilities.

In response to the need for a coordinated national approach to competing successfully in international markets, ESS has developed an international business strategy that lays out a framework for government–industry cooperation over the next five years. The strategy discusses ways to gather foreign market intelligence, acquire knowledge of international developments and disseminate this information to the Canadian earth sciences industry for exploitation.

Current world earth sciences markets are highly competitive and Canada is a significant player in many of these markets. For example, in 1996, Canada possessed more than an 18 percent share of the estimated $10-billion annual global geomatics market. In addition, growth in the global geomatics market is estimated at 15 to 20 percent per year. Factors affecting the development of the entire earth sciences market are not only technical. Regulatory and business issues are important considerations as well. It is critical for ESS to remain informed about these factors and to share this information with industry.

Geomatics Trade Post

The Earth Sciences Sector, in conjunction with Canadian industry, has identified Latin America as an area of sustained growth in demand for geomatics and geoscience services. ESS took an important step toward developing this market by establishing a trade post in Buenos Aires, Argentina in 1998. By doing so, ESS demonstrated its commitment to and leadership in exploiting the global market for the Canadian geomatics and geoscience industries.

The post's primary objective was to increase, over three years, the annual gross revenues of Canadian industry from export activity in Latin America to at least $30 million. Other objectives included reducing the risk and cost of doing business in Latin America; enhancing Canada's international competitive advantage in sourcing, securing and servicing multiphase projects; and providing small and medium-sized firms with opportunities to participate in larger projects.

During the past year, the post's activities have helped Canadian companies meet the $30-million target. This year alone, the value of Canadian projects secured with the assistance of the trade post was $25.9 million. The post has also been successful in generating revenue for the Sector. In addition to meeting this key financial target, the post has been promoting government-to-government activities. It has initiated the signing of memorandums of understanding with Argentina, Peru and Uruguay, and discussions with Brazil and Mexico. In addition, post staff visited more than 10 government organizations throughout Latin America; provided Canadian business with more than 100 contacts and leads; and facilitated more than 50 visits to Latin America by Canadian firms.

Geological Survey of Canada's Proposal-driven System for S&T

As a result of the S&T capacity study ESS finished in 1998, the bedrock workshop GSC conducted in 1997 and the departmental drive to increase accountability, the GSC is moving towards a peer-reviewed, proposal-driven system to select the S&T activities it will pursue. It will begin implementing the system in the 2000/2001 fiscal year. The process will likely take a few years to complete, as funding becomes available when GSC ends ongoing projects and completes commitments to partners. Internal and external peers will review each proposal using the PROGRID® system. This system uses numerical scores and asks proponents to rank their proposals using a series of hierarchical criteria, dealing with three major themes: quality and suitability; feasibility and cost; and benefits and outcomes. The hierarchical criteria include questions on partnerships, clients, capacity-building and other factors. All proposals must be consistent with ESS strategic goals and objectives, as stated in the Sector's strategic plan; conform to the Intergovernmental Geoscience Accord; and be examined to determine whether they address agreed-upon priorities.

Intergovernmental Geoscience Accord

The current Intergovernmental Geoscience Accord will expire in September 2001. In preparation for its renewal, a member of the Committee of Provincial Geologists, who was formerly the head of the Alberta Geological Survey, has been seconded to the GSC to coordinate its review. Provincial geologists have indicated that the wording of the existing accord is largely acceptable but that some improvement is needed in the accord's implementation.

The first step will be to evaluate the existing accord. A questionnaire and the existing accord have been distributed to the National Geological Surveys Committee. Analysis of the questionnaire results will help define the next steps in the review process.

Resource Innovation Action Plan

The Resource Innovation Action Plan (RIAP) is the government's response to key challenges facing leading export sectors, including the natural resources sector. It responds to the government's commitment, in the October 1999 Speech from the Throne, to building a dynamic economy for the 21st century and a better quality of life for Canadians through innovation and development of new technologies. RIAP proposes a broad-based approach based on partnerships with federal departments, industry, universities, provinces and territories, and other stakeholders. It supports the continued growth and competitiveness of a high-tech, knowledge-intensive natural resources sector.

RIAP comprises three principal elements, each addressing a critical innovation gap:

- GeoConnections and NRCan's ResSources initiative, to address the need to disseminate knowledge more effectively;
- linkages with Human Resource Development Canada's Sector Councils and other programs, to address the skill requirements of the natural resources sector; and
- strategic S&T initiatives, to address critical R&D gaps, increase the rate of technology transfer and develop strategic alliances.

RIAP's 11 strategic S&T initiatives were identified after extensive consultations with industry associations and individual firms, federal departments and agencies, provinces and territories, and other stakeholders. The initiatives target strong growth opportunities in resource exploration, development and management, as well as environmental stewardship and value-added production. The ESS initiatives are the Targeted Geoscience Initiative and Geomatics for Sustainable Resource Management.

Northern Activities and Initiatives

ESS, on NRCan's behalf, is at the forefront of a collaborative multi-agency effort to develop a federal northern S&T strategy. The strategy will identify research gaps, research priorities and resources needed to meet current and future environmental, social and economic needs of northern residents and government decision-makers at all levels.

The strategy is being developed under the direction of the Assistant Deputy Ministers' Interdepartmental Committee on Northern S&T. As the newly elected chairman of the Committee, the Assistant Deputy Minister (ADM) of ESS is seeking innovative solutions for developing a coordinated northern S&T program involving all northern stakeholders. The northern strategy is being crafted within the framework of the government's overarching S&T strategy and emerging science capacity agenda, and in keeping with the government's efforts to find the best approaches to weaving Canada's domestic and international commitments and the North's special needs into the national agenda. The northern S&T strategy is being designed to complement the Department of Foreign Affairs and International Trade's new Northern Dimension of Canada's Foreign Policy and the Federal Northern Sustainable Development Strategy.

A coordinated northern S&T strategy, developed in partnership with other federal departments, territorial governments and the academic community, will help position northern research in support of national environmental, economic and social policy and program priorities. Scientists and northerners will receive education and training opportunities to help strengthen Canada's northern S&T capacity and expertise. In addition, logistics support for northern research will be expanded through the Polar Continental Shelf Project.

Natural Hazards and Disasters: Monitoring, Research and Response

Natural disasters occur regularly in Canada, sometimes with devastating effects. Natural hazards include earthquakes, tsunamis, volcanic eruptions, floods, landslides, geomagnetic storms, permafrost, frost-susceptible material, gas hydrates and coastal erosion. The population of southwestern British Columbia lives with the ongoing threat of a major earthquake. More than four million Canadians were victims of the 1996 Saguenay flood, the 1997 Red River flood and the 1998 ice storm. Since 1994, costs related to natural disasters in Canada have increased 65 percent compared to costs during the previous five-year period. Reasons for this trend include the country's aging physical infrastructure, climate change, and the fact that more people with more expensive personal possessions are living in urban centres than was the case in the past.

Safeguarding Canadians from natural hazards requires a detailed knowledge of Canada and its resources, and a supporting policy framework. ESS is playing a growing role in monitoring, assessing and researching natural hazards; developing mitigation policies and information services; and responding to emergencies and disasters, including civil emergencies, mine accidents, radioactive spills, and satellite and airline crashes. NRCan's direct responsibilities are outlined in its emergency preparedness plan and in Memorandums of Understanding (MOUs) with, for example, the Transportation Safety Board of Canada and Emergency Preparedness Canada.

In 2000/2001, ESS will develop an integrated approach to examining the scope, frequency and socio-economic impact of natural disasters. The Sector will address its current research and response capacity to meet key areas of federal responsibility in monitoring, managing and responding to these risks. By taking measures to prepare for emergencies and to mitigate the impact of hazards, ESS will help Canadians avoid costs. Canada will also benefit from opportunities to export technologies used to monitor the environment and manage disasters.

Sustainable Communities Initiative

The Sustainable Communities Initiative is a federal government project to build and strengthen the capacity of Canada's Aboriginal, rural and northern communities to plan and make decisions. It will help communities use the Internet to obtain, generate and use information. Federal departments active in the field of community development—such as NRCan, Industry Canada, and Agriculture and Agri-Food Canada—deliver the program in partnership with provincial, territorial and local governments.

NRCan will work with other federal departments, provinces, territories, community and municipal governments, Aboriginal groups, volunteer organizations and other non-governmental organizations (NGOs) to deliver geospatial and geoscience information for decision-making regarding land use, resource management and sustainable development. This information will be portrayed geographically in the form of computer-based maps that are easy to understand.

RADARSAT-2

The RADARSAT-2 program covers the design, development, testing, deployment and operation of a space-borne Synthetic Aperture Radar (SAR), which will provide global coverage of terrestrial phenomena. This program is a follow-up to RADARSAT-1 and its long-term objective is to create a commercial satellite remote sensing business in Canada. RADARSAT-2 represents a significant evolution from RADARSAT-1 with new capabilities, such as improved resolution to three metres. It is also designed to ensure the Canada's continued leadership in the global SAR marketplace. RADARSAT-2 will provide data for government and commercial users and is scheduled for launch in late 2002.

In response to Cabinet's direction in the Long Term Space Plan II, the private sector will own and operate RADARSAT-2. To deliver this program, the Canadian Space Agency (CSA) has entered into a master agreement with a private sector partner, MacDonald Dettwiler & Associates (MDA), which was selected through a competitive process. Under the terms of the master agreement, the government is contributing $225 million to the construction cost, with MDA providing $80.5 million in financing. MDA will bear the costs of operating the spacecraft, as well as marketing and business development costs, and will be responsible for the business development and full commercial exploitation of the program.

The Canada Centre for Remote Sensing (CCRS) will provide data reception and archiving services for the RADARSAT-2 program, through its two stations in Saskatchewan and Quebec. CCRS will continue to develop and demonstrate new applications in cooperation with the private sector, other stakeholder departments and users. Priorities include satellite earth observation for resource management, environmental monitoring, climate change monitoring, and disaster management.

As a result of technology transfer and the active development of the Canadian geomatics and remote sensing industry, Canada enjoys market and technology leadership in civil radar satellites, ground receiving stations and application of radar images. The development of the high performance RADARSAT-2 will further enhance Canada's position in earth observation.

ESS could receive $60 million over the next five years, from the 1999 Budget allotment to the CSA, for the Canadian Space Plan. This plan identifies "Earth and environment" as an area of strategic importance, with objectives "to enhance Canada's ability to understand, monitor, predict and protect the Earth and its environment, and to ensure that Canadian industry maintains leadership in the emerging global earth observation market." As a stakeholder, NRCan will participate in the new management framework for the Space Plan.

NRCan and CCRS will also participate in the interdepartmental working group that is developing the access control policy for commercial remote sensing satellites such as RADARSAT-2. The policy will allow information to be made available to potential clients without compromising national security and international interests.

GPS•Corrections

Global Positioning System (GPS) technology has enabled unprecedented worldwide use of positions, to the extent that positioning is becoming known as the next utility. While once the sole domain of land surveyors, now anyone with a GPS receiver can easily determine his or her location to an accuracy of about 100 m. This tremendous expansion in capability has created new needs and opportunities related to the national standard of reference for positions. As the agency responsible for the national spatial reference frame, NRCan's Geodetic Survey Division has responded by developing GPS•Corrections, known as GPS•C, a unique and cost-effective enhancement of GPS. Derived from the GPS tracking stations of the Canadian Active Control System, GPS•C is a national infrastructure that permits GPS users to determine their position within 10 m, or better, and gives them direct access in real time to the Canadian Spatial Reference System.

The GPS•C initiative is aligned with NRCan's efforts to enhance the development of a knowledge-based economy and society. As an innovative development enabled by converging technologies, GPS•C allows users to share spatially related data from diverse origins. A federal, provincial and territorial collaboration, spearheaded by the Ontario and B.C. provincial geomatics agencies and including GeoConnections, has recognized the value of GPS•C and is now developing a way to distribute the corrections nationally. The goal is to provide free and open access across the country and beyond by 2001. Plans call for corrections to be broadcast via satellite, giving industry opportunities to redistribute them and develop value-added applications. GPS•C will serve as an infrastructure for the wireless communications and information-based applications.

GeoConnections: Canada's Geographic Information on the Internet

The Minister of Natural Resources launched GeoConnections, a partnership initiative, at the International Cartographic Association conference in 1989. GeoConnections makes geospatial data and services accessible to all Canadians through the Internet. Under the initiative, governments are working with industry and academia to expand the range of geospatial data applications and services, to enhance the skills and knowledge of Canada's geomatics workers, to develop new products and new uses for existing products, and to create new business opportunities.

Since many technologies, standards, protocols and maintenance procedures are needed to make geospatial information accessible and to give Canadians a world-leading information technology infrastructure, GeoConnections has funded several programs. These programs include GeoExpress, the National Geo-Info Framework, Geo Partners, GeoInnovations, the Sustainable Communities Initiative, the National Atlas of Canada and the Geomatics Skills Network.

The GeoConnections secretariat, which resides within ESS, implements the GeoConnections initiative. It also coordinates the development of the Canadian Geospatial Data Infrastructure (CGDI) by supporting activities across the federal, provincial and territorial governments, the private sector and academia.

A shared leadership manages GeoConnections. Currently, the partners include approximately 20 federal departments and agencies, as well as numerous provincial and territorial agencies, the private sector and Canadian universities. These partnerships and links are very strong and are continuing to expand due, in part, to extensive program activities.

For further information on GeoConnections, go to http://www.geoconnexions.org.

Climate Change

ESS has been monitoring the impact of increases in global temperature on the earth's surface. These increases are poorly understood, yet form the basis for determining the impacts of climate change on Canada. The Sector has helped develop several monitoring processes, including ways to monitor glaciers *in situ* and to observe the growth and decay of vegetation as a source or sink of carbon. The Canada Centre for Remote Sensing and the Canadian Forest Service are jointly studying sources and sinks of carbon. The results of this project will provide important input into the next round of negotiations on climate change.

In addition to its work on carbon, ESS has also been advancing the use of satellites to collect data on the degree of reflection and absorption of solar radiation by the atmosphere. As well, the Sector is researching potential applications of Global Positioning Systems (GPS) and Very Long Baseline Interferometry (VLBI) to climate change monitoring.

In 1998, following a meeting of federal, provincial and territorial ministers of energy and environment, the government established the Climate Change Action Fund (CCAF) to help Canada meet its international climate change commitments. The CCAF provides the framework for federal government priorities and actions related to climate change. The Sector has assumed many responsibilities for administering the fund. The Sector's ADM is the departmental champion and ESS has established a liaison office to coordinate interdepartmental activities. The 2000 Budget announced new funding totalling $210 million over three years for the CCAF, along with other federal energy efficiency and renewable energy programs.

The 2000 Budget also announced the government's ongoing support, through the creation of the Canadian Foundation for Climate and Atmospheric Sciences, for academic research to address the impact of climate change and air pollution on human health. Specifically, the Budget announced funding of $60 million to create a network among science institutes and universities across Canada. The new foundation will provide research grants to teams of Canadian scientists over the next six years. This program will strengthen Canada's climate research capacity and encourage researchers to remain in Canada.

Water Issues in Canada

Water is vital to the health of Canadians, our economy and our ecosystems. Water resources are drawn from surface water in lakes, rivers and reservoirs, and from groundwater aquifers. Reliance on groundwater is increasing in Canada, but water resources will likely be threatened by oversuse, competing demands, pollution, land-use change and climate change. These threats make it imperative for Canada to safeguard and manage its water resources more effectively.

At the government's Roundtable on Water held in January 2000, participants recognized the need to gain a better scientific understanding of the quantity and quality of Canadian water resources. A growing number of stakeholders, such as the Canadian Geoscience Council and the International Joint Commission, are calling for the federal government, NRCan and ESS in particular to assume a stronger role in providing fundamental geoscience information to address water-related issues. The scarcity of this information is seen as a major impediment to decision-making.

To meet Canada's information needs on water-related issues, ESS will proceed with the following initiatives.

- ESS will characterize and map groundwater systems. Canadians need this knowledge to manage groundwater resources sustainably and to address such issues as water supply, water quality protection and land use. ESS is characterizing and mapping the country's major and strategic aquifer systems in partnership with provinces and municipalities. Study areas include the Oak Ridges Moraine complex north of Lake Ontario; the greater Winnipeg area; surficial aquifers of the Laurentian piedmont area between Quebec City and Trois Rivières; and the St. Lawrence Lowlands bedrock aquifers in southwestern Quebec. Funding will be sought through the Maritimes Groundwater Initiative to begin new projects in New Brunswick, P.E.I. and northern Nova Scotia.
- ESS will continue implementing standard databases for national information on groundwater and will make it easier to access these databases through the Internet (HYDROLINK). The Geoenvironmental Information Management System (GIMS) will provide a user-friendly interface for managing hydrogeological data.
- ESS will hold discussions with Environment Canada to decide how best to exert federal leadership in the area of groundwater. This will set the stage for discussions with the provinces on ways various stakeholders can jointly address a large number of current and emerging issues. This process has already begun thanks to the consultation process to develop the Federal Freshwater Strategy and through regional workshops, such as one recently held in the Prairie and Maritime provinces.
- ESS will pursue initial contacts with the International Joint Commission to investigate how ESS can provide information needed to deal with transboundary issues, particularly in the Great Lakes/St.Lawrence and Prairie basins. Specifically, discussions will focus on ways the government can provide basic groundwater information, as recommended in the *Interim Report on the Protection of the Waters of the Great Lakes*.
- With the United States Geological Survey, ESS will explore avenues for joint agency studies on aquifer delineation in the Great Lakes Basin and in the Interior Plains. If it participates in the Great Lakes 2020 initiative, ESS may also have opportunities to proceed with studies both on land (groundwater quantity and quality) and in the lake basins (lake level and flow variations).
- Since climate change will affect groundwater quantity and quality and increase water consumption, ESS will look at setting up projects in different regions of Canada to assess climatic vulnerability. In conjunction with a national climate change impacts and adaptation research network being developed through the CCAF, ESS will also assess strategies to make resources last as long as possible.
- Using resources from the Red River Valley Flood Protection Program and other sources, ESS will conduct studies to gain a better understanding of the flood risks in the Red River Basin. In particular, the Sector will establish the recurrence and magnitude of past floods and investigate the geological controls responsible for the floods.

Aboriginal Strategy

Increasing Aboriginal self-government is having an important effect on the Sector's Legal Surveys Division. The recently passed *First Nations Land Management Act* begins the devolution of land management to First Nations. In keeping with the Crown's fiduciary relationship with First Nations, the Division is looking at ways to adapt the Canada Lands Survey System. It is also instituting training programs that will prepare Aboriginal communities to maintain their own land-management regimes. The Division is exploring ways to deliver survey services directly to these groups, rather than through a national program funded by Indian and Northern Affairs Canada (INAC). It will also continue its discussions with INAC on funding for land surveying services related to reserves, treaty land entitlements, and comprehensive land claims negotiations and settlements.

In parallel, the Geological Survey of Canada is considering the extent of its fiduciary responsibility to provide geoscientific information on Aboriginal lands. ESS will consider contributing to INAC's initiative to increase Aboriginal people's participation in the resource-based economy. It will work to help Aboriginal communities acquire the skills and knowledge they need to make decisions on sustainable development.

ESS responded to the creation of the Territory of Nunavut in 1999 in two specific ways: Legal Surveys Division established a client liaison unit for Nunavut, and the Geological Survey of Canada entered into a tripartite agreement on the Canada–Nunavut Geoscience Office. ESS will use these two frameworks to design and launch cooperative programs to meet the geomatics and geoscientific information needs of the new territory. The federal Northern Economic Development Strategy is studying topographic and geological mapping requirements in Nunavut.

ESS ResSources

The ESS ResSources initiative provides a framework to help parties create, share and use geo-information. As part of NRCan's ResSources initiative, ESS will provide stakeholders with the tools to access, analyze, visualize and manipulate its knowledge assets so that they can make informed decisions about the natural resources sector. ResSources is designed to provide instantaneous connections to seamless geo-information for the benefit of all Canadians.

ESS ResSources is built on key initiatives already in place, such as GeoConnections; the MOU signed by the four natural resources-related departments and Health Canada; ResSources GSC; the Sustainable Communities Initiative; and the S&T Capacity Building Initiative. It will make it easier to transfer information, knowledge and tools among these initiatives. It will also help identify synergies and partnerships. As a result, all these information activities will be better integrated and ESS will provide its clients with more timely, more useful information that is easier to retrieve.

Strategic Plan for Recruiting, Retaining and Rejuvenating Human Resources

After assessing S&T capacities within ESS for the next decade, the Sector developed a strategy to recruit, retain and rejuvenate human resources. The four main thrusts of the strategy involve

- recruiting new staff to help ESS deliver its current and future business;
- providing an attractive work environment;
- providing career development tools and coaching for employees; and
- seeking partnerships with other organizations to open up new horizons for ESS employees.

Major components of the strategy, which will be launched in 2000/2001, are as follows.

Under a strategic plan for external S&T recruiting, ESS will recruit approximately 25 entry-level S&T employees (equivalent to two percent of the ESS budget) in the following 12 priority areas of expertise:

- multidisciplinary geology and geophysics (marine, bedrock, surficial);
- mineral deposits, particularly gold;
- hydrogeology;
- climate change science and monitoring;
- natural hazards science;
- data modelling and simulation;
- environmental geochemistry;
- space geodesy;
- application of earth observation imagery to mapping;
- hyperspectral earth observation imagery;
- legal surveys; and
- Geographic Information Systems (GIS) and information management.

ESS will develop a skills profile to be used in the selection process. It will help the Sector find employees who have the following qualities, as well as relevant professional qualifications:

- flexibility;
- team spirit;
- entrepreneurial spirit;
- a multidisciplinary approach;
- communication skills; and
- information technology skills.

Thirty percent of new employees will be on term appointments for at least two years, and the remaining 70 percent will occupy indeterminate positions. New hiring should help ESS achieve Public Service Commission of Canada employment objectives for equity target groups over the next three years, which are indicated in the following table.

Employment Equity	**ESS**				**NRCan**	
		% of total ESS employees			**% of total NRCan employees**	
	N1	**2000/ 2001**	**2001/ 2002**	**2002/ 2003**	**N2**	**1999/ 2000**
Total Employees	**1 490**				**3 949**	
Equity Target Groups						
Aboriginal persons	17	2.5	2.5	2.5	55	1.4
Visible minorities	64	4.2	4.4	4.4	260	6.6
Persons with disabilities	40	2.2	2.2	2.2	120	3.0
Women	454	35.0	37.0	37.0	1 402	35.5
Francophones	382	30.0	31.0	31.0	1 141	28.9

N1 = numbers of ESS employees in 1999/2000, N2 = numbers of NRCan employees in 1999/2000

ESS will recruit, retain and rejuvenate its human resources through

- the Geomatics Professional Development Program (GPDP);
- the Professional Enhancement Program (PEP);
- the Management Development Program;
- the ESS–Natural Sciences and Engineering Research Council (NSERC) research partnership program;
- scholarships, including Aboriginal scholarships; and
- the Federal Student Work Experience Program (FSWEP).

In addition to these initiatives, the Sector will emphasize continuing education; collect and analyze data through departure interviews; and develop and implement an action plan to address employee survey results concerning the work environment. ESS will emphasize external recruitment and internship programs by developing a marketing plan that includes web sites and advertisements in the print media, and by targeting university campuses and professional associations, such as the Geomatics Industry Association of Canada (GIAC).

The GPDP will include 12 new participants every year and will receive funding from the GSC, GC, the NRCan WINS initiative, and 10 private sector partners and public agencies. Work assignments under this program will be at ESS, in the private sector or at a government agency.

The following table shows the actual (1999/2000) and forecast numbers of students whom ESS will recruit, by type of initiative.

Type of Initiative	Numbers of Students			
	1999/2000	2000/2001	2001/2002	2002/2003
Fellowship	40	45	50	50
Co-op	60	90	95	100
FSWEP	120	205	215	220
Total	**220**	**340**	**360**	**370**

Professional Enhancement Program

The Professional Enhancement Program (PEP) allows ESS and external organizations to participate in collaborative research, and to share expertise and operating costs for mutually beneficial projects. The main objective of this program is to foster alliances that meet the strategic research goals of ESS and external organizations.

The foundation of the program is a work assignment that broadens the skills and experience of participating staff involved in geoscience or geomatics R&D.

Any qualified indeterminate ESS employee may participate in PEP. The Program is also open to employees in external organizations, including companies, professional associations, universities, centres of excellence, and other government departments and agencies.

PEP will focus on priority areas identified in the GSC, GC and PCSP strategic plans, where the sharing of expertise through employee work assignments between ESS and an external organization will generate value-added synergy for a project. The Sector and the external organization involved in a particular project will define overall project goals and milestones. Each PEP project will be research-oriented and will provide tangible benefits to ESS and the external organization.

Each project will be governed by a negotiated agreement that will specify the obligations and expectations of each party, as well as how the results of the project are to be shared. ESS and the external organization will share each project's operating costs in accordance with the agreement. The home organization will continue to pay the salaries of employees on a work assignment.

ESS and Public Service Employee Surveys

In 1999, ESS staff participated in two employee surveys. In March, ESS conducted its first survey, in a series of planned biannual staff surveys, and in May and June, ESS participated in the public sector survey conducted by Treasury Board of Canada, Secretariat (TBS). The ESS Employee Survey focused on the ESS Management Framework and perceptions about its implementation. There were three sections in the survey: Organizational Climate, Management Practices and Job Satisfaction.

Fifty-two percent of ESS employees responded to the ESS Employee Survey. ESS presented the results to staff at the annual Best Practices Forum held in May, and individual managers presented branch, centre and division survey results to staff in the fall. The Sector results are available internally at http://essbb.gsc.gc.ca/intranet/admdocs/essconf_e.htm.

Senior management, as well as branch and division management teams, addressed the survey results. At the fall senior management meeting, ESS task forces on "Fairness" and "Communications" were established and the Sector's "Visioning" initiative was reaffirmed. Within divisions, management and staff discussed the survey results. By December, each ESS unit surveyed had developed an improvement plan.

The Public Service Employee Survey data were released in November and NRCan had a response rate of 56 percent. The survey covered six broad areas and established a baseline across the federal public service. The survey data are available at http://www.nrcan.gc.ca/survey_sondage/index-e.htm and the Earth Sciences Sector results are available at http://www.nrcan.gc.ca/survey_sondage/15/300/result-e.htm.

Within ESS, management began a dialogue with staff and updated improvement plans in January 2000. Outside the department, TBS coordinated responses and data from individual federal departments. The survey results identified some common issues. Issues identified for NRCan and ESS related to discrimination, fairness, harassment and workload. The departmental working group on the survey is preparing strategic options for NRCan, and TBS will present its analysis to the federal government's Committee of Senior Officials (COSO) in late spring or early summer 2000.

Universal Classification Standard

The Universal Classification Standard (UCS) is the new instrument for comparing the relative value of various public service work. This new "universal" standard has been designed to replace the 72 classification standards formerly used to evaluate work done by clerks, nurses, scientists, financial officers and other public service workers.

Even though the UCS schedule is established by TBS and by collective bargaining negotiations, the Sector has positioned itself to meet the following objectives for 2000/2001:

- to position the department and ESS for conversion to UCS in accordance with schedules established by TBS and the collective bargaining process;
- to help establish accurate UCS work descriptions, through the participation of functional managers, employees and supervisors;
- to help evaluate UCS work descriptions for the purpose of conversion to UCS;
- to educate and inform managers and employees about UCS;
- to respond to grievances generated by the conversion process; and
- to analyze and respond to organizational impacts and organizational design issues.

Modern Comptrollership

The Government of Canada defines modern comptrollership as a set of principles that describes how management will carry out the stewardship dimension of its responsibilities to the institution and its' governing body. It is embedded in every management activity. Traditionally, comptrollership in the federal government and at NRCan has focused primarily on financial controls and accounting, and has been largely regarded as the main responsibility of financial officers. But management needs in the federal government have made this traditional focus insufficient.

Most of the changes will occur in the areas of business planning, resource allocation, financial management, financial reporting, executive development and renewal, and service delivery. Some of these initiatives include improving reporting to Parliament, modernizing financial information and accounting systems, giving Treasury Board some of the attributes of a management board, adopting alternative approaches to delivering services, and refreshing the public service and developing its human resources. Accordingly, modern comptrollership must be embedded, in some measure, in every management activity.

At NRCan, the structure of the reports to Parliament has already been modified to provide information on outputs and outcomes by goals. In 2000/2001, NRCan will modify its financial system to accommodate accrual accounting, as required by the Financial Information Strategy (FIS). All assets will be recorded and included in a subsystem to allow amortization to be calculated. A major review of the financial information produced for ESS managers is underway. Consultations with every stakeholder will be done during this fiscal year. Business processes will also be reviewed to ensure efficiency and control in financial operations. In this era of modern comptrollership, program managers and specialists share responsibility for sound management and achievement of expected goals. ESS will establish communication processes to ensure that finance and administration specialists provide managers with the best tools available so that they can deliver their programs efficiently.

2 Earth Sciences Sector: Major Components and Financial Summary

The Earth Sciences Sector (ESS) is Natural Resources Canada's (NRCan's) largest Sector. It comprises Geomatics Canada, the Geological Survey of Canada, Polar Continental Shelf Project and ESS Corporate Services.

Earth Sciences Sector Funding by Major Component

	1999/2000	2000/2001	2001/2002	2002/2003
Geomatics Canada	93 216	103 682	102 358	101 904
Geological Survey of Canada	67 363	66 561	65 816	65 708
Polar Continental Shelf Project	3 593	4 122	3 772	4 022
ESS Corporate Services	18 271	19 988	19 823	19 826
Total ($000)	**182 443**	**194 353**	**191 769**	**191 460**

(ESS Corporate Services includes the ADM's Office; the Business Development Office; the Chief Geoscientist Office; ESS Communications; Human Resources; Policy, Planning, Information and Services Branch; the Quality Management Advisor; Senior Advisors; and the Sector Financial Advisor Office.)

ESS is committed to delivering its program and regulatory responsibilities in partnership with clients and stakeholders in other federal departments, the provinces and territories, the private sector and academia. To ensure the comprehensive representation of client requirements, the department has established the Minister's National Advisory Board on Earth Sciences (MNABES) to advise the Minister of Natural Resources on the Sector's scientific and program directions.

To achieve the vision expressed by the Minister, and due to scarce resources available from traditional sources of funding, the Sector is actively developing alternative sources of funding. ESS fosters a strong relationship with its stakeholders, both internal and external to the government, by signing cost-sharing arrangements to develop joint projects. The Sector also sells products and provides consulting and technical services, both domestically and internationally, on a cost-recovery basis. The following tables summarize the funding received from those alternative sources on a cash basis and indicate appropriation funding by expenditure category.

Earth Sciences Sector Funding Mechanisms

	1999/2000	2000/2001	2001/2002	2002/2003
Appropriation from Parliament	142 336	158 799	157 589	157 157
Vote netting	2 823	2 827	2 829	2 829
Revolving Fund	16 284	17 218	17 218	17 218
Joint projects with external parties	6 000	4 142	3 636	3 509
Joint projects with other federal departments	15 000	11 367	10 497	10 747
Total ($000)	**182 443**	**194 353**	**191 769**	**191 460**

(Except for appropriations from Parliament, figures represent targets to be met by ESS managers.)

Earth Sciences Sector Appropriation by Major Category of Expenditure

	1999/2000	2000/2001	2001/2002	2002/2003
Salaries	70 663	73 635	73 643	73 611
Employee benefits plan	14 131	14 359	14 361	14 355
Operating expenses, including capital	56 638	66 634	64 581	64 187
Grants and contributions	904	4 171	5 004	5 004
Total ($000)	**142 336**	**158 799**	**157 589**	**157 157**

Geomatics Canada

Geomatics Canada (GC) programs underpin key federal government policy objectives, including knowledge infrastructure, promotion of jobs, sustainable development, and health and safety. They support a wide range of activities of national interest. These activities include maintaining Canada's borders; regulating and surveying Canada Lands; providing the national surveying, spatial positioning and mapping fabric; developing national scale maps; and collecting and managing a growing volume of digital data. GC also provides leadership in the use of topographic map information, Global Positioning System (GPS) technology and remote sensing applications.

GC uses a Revolving Fund (RF) to respond to external demands for its products and services. An important strength of the RF is that it directly supports NRCan's commitment to reduce the subsidization of the department's commercial products and services by implementing user fees sufficient to recover costs. The RF aims to be self-sufficient. However, unlike commercial businesses—which strive for maximum profits—the Revolving Fund's target is to achieve a zero balance. Each year, GC produces a separate Geomatics Canada Revolving Fund Business Plan.

The following organizations deliver GC programs.

Geodetic Survey Division

The primary role of the Geodetic Survey Division (GSD) is to establish, maintain and improve the Canadian Spatial Reference System (CSRS) and to facilitate access to this national standard in accordance with evolving client needs and advances in technology. From geomatics and navigation to natural resources and the environment, this national infrastructure and other related standards serve as a reference, allowing users to exchange and merge spatial information seamlessly. The CSRS ensures that spatially referenced information from federal, provincial, municipal and private sources is compatible. It is therefore fundamental to initiatives such as GeoConnections.

As economies throughout the world become more dependent on information technologies, it becomes necessary to ensure a globally consistent national reference for spatial positioning and related applications. GSD's role in the International GPS Service, the International VLBI Service and international gravity programs serves Canadian S&T and ensures global consistency of national spatial reference standards. Active control system technologies now form the basis of the geodetic program. In this era of space-based positioning, GSD has already adapted its operations to permit eventual widespread access to the reference system.

Legal Surveys Division and the International Boundary Commission

Under the *Canada Lands Surveys Act* and related legislation, the Surveyor General and the Legal Surveys Division (LSD) are responsible for the Canada Lands Survey System. This responsibility includes regulating legal surveys; maintaining a publicly accessible archive of survey documents and information; surveying Canada Lands, including Aboriginal land claims; and protecting the interests of the Government of Canada with respect to these lands. The International Boundary Commission is an integral part of LSD and is jointly responsible, with its American counterpart, for maintaining the boundary between Canada and the United States and assuring its accurate depiction on official maps.

In the 1999/2000 fiscal year, LSD received a $1 million transfer from the TBS Program Integrity initiative to support its ongoing but underfunded program activities. It is hoped that this funding will continue in 2000/2001 as LSD's financial needs remain acute.

Canada Centre for Remote Sensing

The Canada Centre for Remote Sensing (CCRS) is internationally recognized as a leading centre of excellence in the use of earth observation data, and supports an expanding industry sector that includes world leaders in global ground station, image analysis and radar mapping markets. CCRS receives, processes, archives and disseminates remotely sensed data for Canada. In conjunction with the private sector, it develops remote sensing technology and applications. Through its National Atlas of Canada team, CCRS also works with industry to develop spatial information applications. CCRS is developing the Canadian Earth Observation Network (CEONet) component of the Canadian Geospatial Data Infrastructure (CGDI) to provide users with real-time access to remote sensing satellite and other spatial databases, both land and marine, through the Internet.

In addition, the GeoAccess Division of CCRS has become the lead agency for the implementation of CGDI as well as the ESS coordinator for the GeoConnections initiative. As part of this commitment, the GeoAccess Division will provide secretariat services to the CGDI.

Mapping Services Branch

As Canada's national mapping agency, the Mapping Services Branch (MSB) acquires, manages and disseminates topographic and toponymic information for the Canadian landmass, and produces and distributes aeronautical charts and publications required to ensure the safety of aviation in Canada.

Using information in the National Topographic Data Base (NTDB), the Centre for Topographic Information produces digital and hard-copy topographic maps at scales of 1:50 000 and 1:250 000. The branch's Aeronautical and Technical Services (ATS) group regularly updates and amends aeronautical charts and publications for air safety in Canada, and maintains a central map printing operation.

In addition to these activities, MSB is the custodian of the federal aerial photography archives and acquires, reproduces and distributes aerial photography. The Branch supports the activities of the Geographical Names Board of Canada (formerly the Canadian Permanent Committee on Geographical Names) by providing a secretariat and maintaining the Canadian Geographical Names Data Base (CGNDB).

Geomatics Canada Funding Mechanisms

	1999/2000	2000/2001	2001/2002	2002/2003
Appropriation from Parliament	62 232	75 536	74 577	74 126
Vote netting	0	0	0	0
Revolving Fund	16 284	17 218	17 218	17 218
Joint projects with external parties	1 200	1 156	1 141	1 141
Joint projects with other federal departments	13 500	9 772	9 422	9 419
Total ($000)	**93 216**	**103 682**	**102 358**	**101 904**

Geological Survey of Canada

The research of the Geological Survey of Canada (GSC) is aligned with NRCan's long-term goals and key ESS objectives and is carried out under six broad programs: Bedrock Geoscience; Surficial Geoscience; Marine Geoscience; Hydrocarbon Geoscience; Minerals Geoscience; and Geological Hazards and Environmental Geoscience. Much of the output of these programs is made publicly available through the cartographic and publishing activities of the Geoscience Information Program provided by the Sector's Policy, Planning, Information and Services Branch (PPISB).

The Bedrock and Surficial Geoscience programs provide the national geoscience knowledge framework that underpins all private and public sector activities related to the sustainable development of Canada's onshore mineral, energy, water and other resources. This knowledge is used to make decisions about land use and public health and safety issues linked to natural hazards. The Marine Geoscience Program provides the same knowledge framework for Canada's offshore areas and supports Canada's offshore sovereignty and territorial claims. The Hydrocarbon and Minerals programs develop models that describe the formation of economically recoverable resources. This research provides new guidelines and technologies for exploration, which not only help maintain robust mining and energy resource industries in Canada, but also underpin the assessment of resource potential in areas scheduled for development or designation as parks. The Geological Hazards and Environmental Geoscience Program seeks, through research and monitoring, to reduce risks from earthquake and geomagnetic hazards, landslides, global climate change, natural release of metals and other hazards in the environment.

Seven divisions in the Minerals and Regional Geoscience Branch and the Sedimentary and Marine Geoscience Branch deliver the components of GSC's scientific program. Each division has primary responsibility for a specific science component carried out on a national scale (for example, minerals). Activities in the four regional divisions may span several science program components that apply to that region.

Minerals and Regional Geoscience Branch

The Minerals and Regional Geoscience Branch comprises the Continental Geoscience Division and the Mineral Resources Division, both located in Ottawa, and GSC Pacific, with offices in Sidney and Vancouver (British Columbia) and in Ottawa.

Continental Geoscience Division

The Continental Geoscience Division provides comprehensive knowledge about the bedrock geology of the Canadian landmass, with emphasis on the Canadian Shield, including knowledge about its architecture and tectonic history. It does so by integrating information from bedrock mapping, geophysical surveys, and geochronology and related studies. Bedrock mapping documents the nature of the earth's crust and its physical geology; geophysical surveys reveal the nature of the earth's crust at depth and its physical rock properties; and geochronology and related studies unravel the time and space dimensions of earth history. The Division also contributes to the national geoscience knowledge base by developing methodologies and standards for digital integration, analysis, and dissemination of diverse data sets and knowledge bases.

Mineral Resources Division

The Mineral Resources Division provides comprehensive knowledge of Canada's mineral resources, develops and tests new concepts and methods for mineral exploration, and provides mineralogical and chemical expertise and services. The Division undertakes systematic geochemical surveys, which constitute the National Geochemical Reconnaissance, and conducts multi-parameter airborne geophysical surveys. As well, it provides information relating to the natural distribution of environmentally significant elements.

GSC Pacific

GSC Pacific is responsible for national programs to monitor seismicity, to establish earthquake hazard zonation and to monitor change in the earth's magnetic field. Underground nuclear explosions are monitored for compliance under the Comprehensive Test Ban Treaty at several seismic stations. The active tectonic growth of the Pacific margin through plate convergence is unique in Canada. Monitoring its ramifications for natural hazards and mineral wealth offshore and in the Cordilleran mountain system is part of GSC Pacific's responsibilities.

Sedimentary and Marine Geoscience Branch

The Sedimentary and Marine Geoscience Branch comprises the Terrain Sciences Division (Ottawa), GSC Atlantic (Dartmouth), GSC Quebec (Sainte-Foy) and GSC Calgary.

Terrain Sciences Division

The Terrain Sciences Division provides comprehensive knowledge of the surficial geology and geomorphic processes of the Canadian landmass. Current activities include applied surficial geology studies, hydrogeological studies of key Canadian aquifers, research on permafrost and gas hydrates, development of mineral exploration methods and environmental geochemistry. The Division also provides geoscience information on natural and human-induced geological processes and hazards that may adversely affect sustainable development, and public health and safety.

Additionally, by monitoring current environmental conditions and evaluating past environmental change, the Division collects baseline information to model, explain and assess potential global changes, including changes in climate. It houses the Climate Change Impact and Adaptation Liaison Office of the Climate Change Action Fund.

GSC Atlantic

GSC Atlantic carries out coastal and offshore geoscientific surveys and provides expert geological, geophysical, geochemical and geotechnical information on the coastal zone, the seabed, offshore sedimentary basins and geological processes. The Division also helps assess resources, hazards and environmental quality for the East Coast and Arctic regions and the contiguous ocean basins. This knowledge base was recently applied to delineate Canada's offshore boundaries under the United Nations Convention on the Law of the Sea.

GSC Quebec

GSC Quebec provides comprehensive knowledge about the geology of the Laurentian Margin (Grenville and Appalachian geological provinces) and the Quaternary geology of eastern Canada. Integrated and multidisciplinary research activities contribute to the Minerals Geoscience Program and the Geological Hazards and Environmental Geoscience Program. The Division is also responsible for the GSC hydrogeology initiative.

In 1988, following an agreement between the Institut national de la recherche scientifique (INRS) (a branch of the Université du Québec), the GSC, INRS-GéoRessources and GSC Quebec formed a joint research centre. This partnership brings together GSC scientists and university researchers and allows strong collaboration with the provincial government and private corporations.

GSC Calgary

GSC Calgary provides comprehensive knowledge, technology and expertise related to national resource estimates for oil, gas and coal, as well as the geology and resource potential of the sedimentary basins of western and northern mainland Canada, the Arctic islands and adjacent offshore regions. The Division serves as GSC's national centre for research in palaeontology, coal and organic geochemistry.

Geological Survey of Canada Funding Mechanisms

	1999/2000	2000/2001	2001/2002	2002/2003
Appropriation from Parliament	58 511	59 928	59 844	59 863
Vote netting	2 552	2 552	2 552	2 552
Revolving Fund	0	0	0	0
Joint projects with external parties	4 800	2 986	2 495	2 368
Joint projects with other federal departments	1 500	1 095	925	925
Total ($000)	**67 363**	**66 561**	**65 816**	**65 708**

Polar Continental Shelf Project

The Polar Continental Shelf Project (PCSP) coordinates logistics support and provides related assistance to advance scientific knowledge of the Arctic region and to help Canada exercise its sovereignty in that region and its adjacent waters. By providing a comprehensive coordination, transportation, communications and logistical support infrastructure, PCSP ensures its clients' maximum physical safety and scientific productivity.

Research supported by PCSP has helped Canada develop a national knowledge base related to more than one third of the Canadian landmass and has contributed to sustainable development in the North. PCSP support has resulted in the identification of mineral and hydrocarbon deposits and has contributed to a better understanding of the human and environmental impacts of development, and of the northern environment's impact on infrastructure development.

As government agencies move toward implementing a northern S&T strategy to more effectively coordinate research priorities and programs, PCSP serves as an excellent example of the cost effectiveness and efficiencies of horizontally managing a program portfolio across departments and client agencies. PCSP is working in partnership with other government agencies—including the Canadian Coast Guard of the Department of Fisheries and Oceans, the Department of National Defence and northern agencies—to maximize the use of their collective resources for the benefit of the northern scientific community. PCSP also promotes partnerships with its scientific client groups through formal and informal joint venture activities, and seeks to extend its services by sharing costs with and recovering expenditures from partners and clients.

PCSP supports not only government and university research in the Arctic, but also community-based traditional knowledge studies and programs conducted by resource co-management boards established under northern land claims agreements. PCSP also provides services to non-Canadian research groups on a full cost-recovery basis and promotes bi-polar scientific exchanges through the Canadian Arctic–Antarctic Exchange Program.

Polar Continental Shelf Project Funding Mechanisms

	1999/2000	2000/2001	2001/2002	2002/2003
Appropriation from Parliament	3 593	3 622	3 622	3 622
Vote netting	0	0	0	0
Revolving Fund	0	0	0	0
Joint projects with external parties	0	0	0	0
Joint projects with other federal departments	0	500	150	400
Total ($000)	**3 593**	**4 122**	**3 772**	**4 022**
Actual/Estimated recoverable expenditures from partners and clients	**1 798**	1 500	1 500	1 500

Earth Sciences Sector Corporate Services

Policy, Planning, Information and Services Branch

The Policy, Planning, Information and Services Branch (PPISB) provides leadership and a central focus for the administrative, information, policy and planning functions of the Sector. It provides support services to the Sector's science programs, delivers the Geoscience Information Program, provides strategic direction and policy coordination, and oversees the management of human and financial resources.

PPISB provides leadership and a central focus for the information functions of the Sector and coordinates, plans and implements the ESS ResSources initiative. It provides library services through the Earth Sciences Information Centre, where it maintains and develops a comprehensive collection of geoscience information for Canadians. It publishes and distributes GSC's scientific output. It also provides a comprehensive digital map production service using leading-edge mapping and Geographic Information System (GIS) software, digital imaging and photographic technologies. It further develops and manages the information technology infrastructure and client services in the area of geoinformatics, while providing advice on informatics policy, planning and the application of technology. The Branch also manages the Sustainable Communities Initiative, aimed at developing the ability of communities to use geospatial data and information technology for community planning purposes.

PPISB delivers general administrative services to the Sector, including services related to facilities, telecommunications, security, inventory, shipping and mail, records, and health and safety training. It provides logistical support to field projects through its Technical Field Support Services group, and provides financial administrative services to Geomatics Canada and ESS Corporate Services groups. These financial services include procurement, accounts payable and receivable processing, and administration of field and travel accounts. The Branch also provides services related to human resources, such as planning, training, renewal and development programs. Key activities include implementation of the Universal Classification System, performance management, staff and management development, and implementation of the ESS Recruitment, Retention and Rejuvenation Strategy, including the Geomatics Professional Development Program, which is part of the Minister's Forward Agenda Initiative.

The Branch provides corporate support to ESS in the areas of strategic direction, policy development, analysis and coordination, intergovernmental relations and program coordination. The Branch also recommends strategic directions and policy options for ESS, a responsibility that includes preparing input to planning and reporting documents for NRCan, Treasury Board of Canada, Secretariat and Parliament. PPISB manages mechanisms linking ESS to stakeholders, including the Canadian Council on Geomatics, the Minister's National Advisory Board on Earth Sciences (MNABES), and the GeoConnections Management Board. It maintains the Cabinet and Parliamentary Affairs Secretariat and provides secretariat support and departmental representation for various ESS and departmental initiatives. PPISB is also coordinating the Sector's initiative to document and communicate the impact and value of its programs. The Branch is implementing the Sector Project System and developing a Sector-wide, systematic approach to management.

Human Resources

The NRCan Corporate Services Sector has assigned the Human Resources Operations Unit (HROU) to provide advice and guidance concerning classification, staffing, staff relations, official languages and workforce adjustment. HROU ensures that ESS takes a coherent approach to staffing and classification and provides support for employer–employee relations.

The ESS Human Resources Planning, Development and Renewal Unit, part of the ESS Division of Management and Administration Services, offers services related to planning, renewal of human resources and professional training programs. The unit's main priority is to help ESS managers lead, motivate, develop and empower their employees so that employees can realize their full potential while delivering services. During the planning period, the Unit will report regularly to the ESS management team on the progress of specific strategic human resources issues. Key issues include performance management, staff and management development, ESS strategic vision support, and implementation of the ESS recruiting strategy, including the Geomatics Professional Development Program, which is part of the WINS initiative.

Business Development Office

The Sector's Business Development Office was established to provide business leadership to the Sector and the Canadian earth sciences community. It provides a common framework for consistent business practices to manage ESS programs effectively and efficiently, and promotes Canada's earth sciences capability nationally and internationally.

The Business Development Office is made up of two teams. The Business Relations team is responsible for international business development, and coordinates and monitors trade and investment issues. It also coordinates incoming and outgoing trade and investment missions, manages ESS exhibits and provides leadership in the implementation of the ESS International Business Strategy.

The Business Management team provides direction and leadership to the Sector in its business processes and activities. In particular, it focuses on planning, policy development, management of the Geomatics Canada Revolving Fund, performance measurement, service quality initiatives, development and administration of contracts and agreements, business communications and evaluations of ESS compliance with business processes. The principal deliverables of the team include the ESS Business Plan, the ESS Price List, the *Business Opportunities Bulletin*, the management of the Revolving Fund, ESS External Standards, as well as guidelines for the measuring client satisfaction and managing intellectual property.

Chief Geoscientist Office

The Chief Geoscientist Office provides leadership and advice to the Sector on matters related to the quality and integrity of ESS science, and is the Sector's principal interface with external scientific organizations and scientific programs. The Office remains abreast of national and international geoscience trends and developments; looks for issues, opportunities, synergies and cooperation; and provides the voice of the ESS science community at the management table.

The Chief Geoscientist Office is responsible for the ongoing review of the Sector's science activities to ensure their excellence and relevance in a national context. These reviews, which began in 1998/1999, have included reviews of the Marine Geoscience, Environmental Monitoring and Minerals Geoscience programs. They are conducted by external agencies operating under terms of reference that ensure credibility and consistency throughout the process.

In 2000/2001, the Chief Geoscientist Office will continue to play an integral role managing and delivering both the ResSources GSC Initiative and GSC's new peer-reviewed, S&T proposal-driven system. It will work with ESS directors general and develop a program to provide professional development to science staff through sharing of scientific expertise and short-term transfers of personnel between ESS and external organizations. This program will ensure that ESS scientists remain in the vanguard of the international earth sciences community.

The Chief Geoscientist Office will also continue to work with the provincial and territorial geological surveys through the National Geological Surveys Committee to ensure that ESS geoscience programs in the provinces and territories are planned and delivered in accordance with the Intergovernmental Geoscience Accord.

Quality Management Advisor

The Quality Management Advisor provides leadership and advice to the Sector on quality management and management improvement activities. Working closely with the NRCan Excellence Office, the Advisor remains abreast of trends and developments in quality management practices in the private sector and in government, both in Canada and in other countries. This knowledge is used to help ESS management identify, plan and carry out management improvement initiatives.

The Advisor uses the ESS management framework and the NRCan *Guide to Good Management* to help ESS managers analyze their management activities against an established set of criteria, develop improvement plans and report against the framework. Specific accountabilities include organizing the annual ESS management retreat, where each management team member assesses how the Sector is performing against the criteria. The assessment, conducted in the 1999/2000 fiscal year, has been analyzed and used to determine ESS priorities and plans for management improvement projects in the coming year. The Advisor shares news of progress with the Sector, the department and the government by posting a biannual report on quality projects on the Internet.

The Advisor also works with ESS management teams to develop and deploy a quality approach to management. Activities include conducting the ESS Employee Survey, assisting with various customer and client measurement initiatives, and helping implement ISO 9000 initiatives. The Advisor provides a range of assessment tools and techniques for improvement.

ESS Communications

ESS Communications provides strategic advice and services to ESS to support external public relations activities and internal communications. The Office consists of the GSC Communications Officer, the Geomatics Communications Officer, the Ministerial and Special Events Officer, and the Senior Communications Manager. ESS Communications is closely linked to NRCan's Corporate Communications Branch through the Sector Strategic Communications Committee (STRATCOM), the Millennium and S&T Communications committees, and numerous other ad hoc committees.

ESS Communications ensures that strategies and guidelines exist for the internal communication of governmental priorities and initiatives. It also identifies key external audiences and opportunities for communicating the range and value of ESS programs.

Sector Financial Advisor Office

The Sector Financial Advisor Office (SFAO) is tasked by the NRCan Corporate Services Sector to assist with the modernization of comptrollership, ESS financial management, and the provision of financial advice and expertise to support the strategic vision and management framework of ESS. The SFAO ensures a coherent approach to financial reporting and management and provides support to the GC Revolving Fund management team. It will also introduce a comprehensive approach to costing within ESS.

As a member of the ESS management team, the Sector Financial Advisor implements the ESS management framework within the SFAO, particularly in the areas of client satisfaction, process improvement and human resources.

Earth Sciences Sector Corporate Services Funding Mechanisms

	1999/2000	2000/2001	2001/2002	2002/2003
Appropriation from Parliament	18 000	19 712	19 545	19 548
Vote netting	271	276	278	278
Revolving Fund	0	0	0	0
Joint projects with external parties	0	0	0	0
Joint projects with other federal departments	0	0	0	0
Total ($000)	**18 271**	**19 988**	**19 823**	**19 826**

(ESS Corporate Services includes the ADM's Office; the Business Development Office; the Chief Geoscientist Office; ESS Communications; Human Resources; Policy, Planning, Information and Services Branch; the Quality Management Advisor; Senior Advisors; and the Sector Financial Advisor Office.)

3 Earth Sciences Sector: Goals, Objectives and Performance Measurement

The ESS Business Plan outlines what the Sector intends to achieve during the three-year planning period and how it will assess its performance. In previous years, ESS has described its plans around the department's goals, objectives and business lines, as well as a set of ESS objectives. This year, however, the Plan is built around the goals, objectives and strategies the Sector developed in its Strategic Plan for 2000–2005. The information is also presented in a new format.

Goals, Objectives and Implementation Strategies

This section describes the goals, objectives and implementation strategies identified in the ESS Strategic Plan for 2000–2005.

ESS GOAL 1: Provide geospatial and geoscientific knowledge on Canada for sound economic, environmental and social decisions.

1.1 Positioning Knowledge:
Maintain and enhance the geodetic infrastructure and the knowledge base for the national standard for spatial referencing and positioning in Canada.

1.1.1 Canadian Spatial Reference Standard: Accelerate the transition to the space-based Canadian Spatial Reference System, as the standard for geospatial positioning.

1.1.2 Global Standards: Increase involvement in space geodesy and gravity fields to develop global standards and advance knowledge on geodynamics, through partnerships in national and international R&D activities.

1.2 Geographic Knowledge:
Provide reliable, up-to-date geographic information and services.

1.2.1 Access to Geospatial Information: Provide access to Earth Observation and other geospatial information to address high-priority government and societal issues through GeoConnections.

1.2.2 Information Dissemination Through GeoConnections: Ensure the accuracy and relevance of geographic data and information through partnerships to acquire and refine the data, and through timely and cost-effective dissemination of data and information, as conventional products and in digital formats through GeoConnections. Completion of mapping of Nunavut is a priority.

1.2.3 **National Topographic Data Base:** Redefine the National Topographic Data Base to provide complete and homogeneous national coverage from a distributed database environment, through partnerships with provincial and territorial agencies.

1.2.4 **Integrated Data Through Partnerships:** Provide and coordinate the appropriate integrated topographic framework data for specific thematic layers (e.g., geoscience, transportation, administrative boundaries, hypsography, forest cover, etc.) for GeoConnections, through partnerships with provincial and territorial agencies.

1.2.5 **High-resolution Satellite Data:** Establish data extraction methodologies to use high resolution satellites for updating topographic and other databases and conventional mapping products.

1.2.6 **Integrated Geospatial Information Products:** Develop integrated geospatial information products with partners.

1.2.7 **Global Positioning System Correction System:** Secure effective development, distribution and use of Global Positioning System Correction System for emerging real-time positioning applications in Canada.

1.3 Geoscience Knowledge:

Develop new updated geoscience data, information, synthesis products and advanced knowledge of earth science processes for incorporation in a consistent and accessible geoscience knowledge base.

1.3.1 **Establishing Geoscience Mapping Priorities:** Establish onshore and offshore geoscience mapping priorities in Canada, through consultation with stakeholders in the provinces and territories, industry, academia and other federal departments, and in keeping with the Intergovernmental Geoscience Accord.

1.3.2 **Mapping Canada's Water Resources:** Establish a national program, in partnership with federal and provincial agencies and others, to map major aquifer architecture and model four-dimensional surface and subsurface water flow in the context of water as a resource.

1.3.3 **Geoscience Mapping Techniques and Standards:** Develop and apply efficient, integrated, multi-disciplinary geoscience mapping techniques and standards, and make these available to stakeholders.

1.3.4 **Partnered Thematic Mapping:** Emphasize multi-disciplinary and partnered thematic mapping and process studies to address the key outstanding questions about the architecture, origin and evolution of Canada.

1.3.5 **Coordinated Studies of Resource Potential:** Conduct and/or coordinate integrated and partnered earth science studies in areas of Canada with the most significant resource potential, to help stimulate resource exploration.

1.3.6 **Increasing Geoscience Capacity:** Increase the scientific capacity of ESS and partners to carry out integrated, multi-disciplinary earth science mapping by enhancing the national role in geochemistry, chronology (isotopes, paleontology), geophysics, remote sensing and geodynamics.

1.4 Cadastral Survey Framework:

Provide a georeferenced digital cadastral framework for integration and dissemination of land-related information.

1.4.1 **Population of Georeferenced Databases:** Complete the population of strategic digital cadastral databases by 2005.

1.4.2 **Dissemination of Land-related Information:** Create an integrated information, dissemination and marketing infrastructure.

1.5 Resource Assessments:

Conduct and communicate the results of resource assessments, as required by federal policy.

1.5.1 **Proposed National Parks:** Provide mineral and energy resource assessments of areas proposed for national parks, as requested, by the federal government, in keeping with the Mineral and Energy Resource Assessment process and in partnership with stakeholders and other government departments.

1.5.2 **Marine Protected Areas:** Establish terms of reference and undertake resource assessments of marine protected areas, in partnership with stakeholders and other government departments.

1.5.3 **Hydrogeological Resources:** Assess hydrogeological resources in basins of national significance, in partnership with other agencies.

1.6 Knowledge Access and Management:

Develop methodologies and infrastructure that will improve the quality, delivery, integration, accessibility and use of geospatial and geoscience information and expertise.

1.6.1 **Management of ESS Information Resources:** Establish, by 2003, the corporate ESS data models, standards and tools required to manage and archive ESS information in a form compatible with GeoConnections and other international data management initiatives, and populate these with key ESS data by 2005.

1.6.2 **Access to ESS Information:** Develop systems to provide stakeholders access to ESS geospatial and geoscience information through a single network gateway that supports delivery of digital products, and provides access to interactive, decision-making tools that enhance the utility of ESS information for both specialists and non-specialists; thereby, encouraging a broader market for ESS knowledge.

1.6.3 **Policies and Standards for Data Integration:** Develop a national program—in partnership with other earth science information providers and through initiatives such as ESS ResSources, ResSources GSC, GeoConnections and GEOIDE to formulate supportive data integration policies and standards.

ESS GOAL 2: Provide geospatial and geoscientific knowledge to help develop and sustain economic and social benefits.

2.1 Resource Exploration:

Promote discovery of the resources required to sustain mineral and hydrocarbon production in Canada, through thematic research conducted in collaboration with provinces, territories, industry and academia.

2.1.1 Mineral and Hydrocarbon Research: Conduct and/or coordinate a partnered national research program into the attributes of both conventional and unconventional mineral and hydrocarbon resources, in order to understand their origin and potential for Canada.

2.1.2 Knowledge of Non-renewable Resources: Maintain and supplement the national knowledge bases on non-renewable earth resources, including alternative fuels—gas hydrates, coal bed methane, heavy oil and bitumen.

2.1.3. Sustainable Resource Exploration and Development: Integrate resource deposit studies, within a partnered multi-disciplinary geological framework to enhance geoscience knowledge in established mining (EXTECH) and hydrocarbon areas, to help sustain investment in resource exploration and development.

2.2 Industry Support:

Enhance the capacity and efficiency of the Canadian geomatics and geoscience industries in order to increase their global competitiveness.

2.2.1 Business Opportunities: Improve business opportunities for Canadian geomatics and geoscience industries, including the development, incubation and transfer of technologies, applications, and national and international standards, and contracting out of ESS activities.

2.2.2 Support to Canadian Businesses: Make ESS expertise available to Canadian companies on a cost-recoverable basis and, where appropriate, assist in delivering successful international contracts.

2.2.3 Technology Transfer: Promote technology transfer to end-users and make commercialization an integral part of all applications development projects.

2.2.4 Competitive Ability of Canadian Industry: Create opportunities for Canadian industry to compete successfully for contracts, through national and international development programs by adopting a Team Canada approach.

2.2.5 Canadian Active Control System: Promote the space-based Canadian Active Control System technology to partners.

2.3 Rural, Remote and Aboriginal Communities:

Assist in building the capacity of rural, remote and Aboriginal communities, and fulfill responsibilities under self-government agreements, Comprehensive Land Claims legislation, and the Treaty Land Entitlement and Specific Land Claims programs.

2.3.1 **Support for Aboriginal Self-governance:** Enhance the capacity of self-governing Aboriginal communities to manage their property rights infrastructure and support training opportunities for Aboriginal people, and provide support for the establishment and processing of geographic names through the Geographical Names Board of Canada.

2.3.2 **Adapting the CLSS in Northern Communities:** Negotiate agreements with Aboriginal groups and northern communities to adapt the Canada Lands Survey System to their individual circumstances and requirements.

2.3.3 **Fulfilling Land Claim and Treaty Responsibilities:** Deliver NRCan's land survey-related commitments under Comprehensive Land Claims legislation, and the Treaty Land Entitlement and Specific Land Claims programs.

2.3.4 **Geoscientific and Geospatial Capacity-building:** Through Sustainable Communities and other initiatives, build the capacity of rural, remote and Aboriginal communities to use geoscientific and geospatial knowledge for decision-making regarding land use, resource management and sustainable development.

2.4 Northern Research:

Provide logistical support and capacity-building to enhance the S&T knowledge base for the sustainable development of the North's natural resources and decision-making on climate change, environmental protection and land-use planning.

2.4.1 **Support for Arctic Research:** Match predicted increases in client demand for co-ordinated cost-effective logistics support and services by Polar Continental Shelf Project to government and non-government Arctic research client groups.

2.4.2 **Geoscience and Geomatics Capacity-building in the North:** Contribute to building geoscience and geomatics capacity in the North, through partnerships with the territorial governments, other government departments, Aboriginal groups and other organizations.

ESS GOAL 3: Provide geospatial and geoscientific knowledge to minimize the impacts of land use, natural resource development and climate change.

3.1 Climate Change:

Understand the earth science aspects of the impacts of climate change and extreme climate events on Canada and, with partners, develop strategies to minimize and adapt to these impacts.

3.1.1 **Earth Science Aspects:** Understand and monitor the relationships between climate, earth systems and human activity to assess the potential impacts of, and adaptation options to, future climate change and extreme climate events.

3.1.2 **Climate System Dynamics:** Conduct studies of past climate changes, threshold events and the earth science controls on climate system dynamics.

3.1.3 **Carbon Sinks:** Monitor and assess, with partners, the potential of various environments for capture and sequestration of carbon dioxide.

3.1.4 **Earth Science Information for Policies and Protocols:** Provide and monitor earth science information for input into policies and protocols concerning adaptation to climate change and mitigation.

3.1.5 **Geodetic and Geodynamic Knowledge:** Promote, in partnership, the application of space-based positioning, Very Long Baseline Interferometry, gravity field determination, and advanced geodetic and geodynamic knowledge to national and international studies of climate change.

3.2 Environmental Stewardship:

Provide geoscience and geospatial knowledge required for environmental policy and risk management of the impacts of natural resource and infrastructure development and use in Canada.

3.2.1 **Impacts of Infrastructure Development:** Understand the physical and chemical properties of surficial, coastal zone and marine materials and their interactions, in order to minimize costs and risk to the environment associated with infrastructure development.

3.2.2 **Anthropogenic Substances:** Understand the processes influencing the movements of substances from anthropogenic point (e.g., mineral and hydrocarbon exploration and production activities) and natural sources to support risk assessments and risk management decision-making.

3.2.3 **Environmental Monitoring:** Provide relevant earth science information and monitoring (through earth observation technologies) for environmental issues through partnerships such as the Toxic Substances Research Initiative, the Metals in the Environment Research Network, and appropriate bilateral and multilateral research agreements.

ESS GOAL 4: Provide geospatial and geoscientific knowledge to enhance the safety and economic security of Canadians.

4.1 Natural Hazards and Emergencies:

Deliver authoritative data, information, advice and support to those responsible for avoiding and mitigating the impact of, and responding to, natural hazard emergencies and disasters.

4.1.1 **Emergency Preparedness:** Maintain and operate, through strategic alliances where appropriate, national networks, observatories and surveillance programs on natural hazards and emergencies to provide risk assessments and information for policy, risk management and mitigation advice; and to assist in the response to hazards and emergencies by providing near real-time and necessary information to the appropriate provincial, national and international agencies (e.g., Emergency Preparedness Canada) and the Canadian public.

4.1.2 **Nature of Earth Processes:** Understand the nature, cause and effects of natural hazards, hazardous conditions and emergencies by studying earth processes.

4.1.3 **Global Disaster Information Network:** Participate in national and international networks related to natural hazards, emergencies and disasters (e.g., Federal Nuclear Emergency Program, Global Disaster Information Network).

4.2 Comprehensive Test Ban Treaty:

Deliver Canada's monitoring service responsibilities under the International Test Ban Treaty.

4.2.1 Monitoring and Reporting Seismic Events: Strengthen monitoring services by enhancing new format data processing, continuously reporting to the International Data Centre, and upgrading the Yellowknife Seismic Array and eight other Canadian Seismic Network Stations.

4.3 Boundaries:

In partnership with the United States Section of the International Boundary Commission, maintain an effective boundary line between Canada and the U.S.A., as set out in international treaties. Define Canada's provincial, territorial and federal political boundaries and international offshore boundaries.

4.3.1 Canada–U.S. Boundary: Maintain an effective boundary between Canada and the U.S.A., following priorities established under the Long Range Forecast of the Canada–United States International Boundary Commission (1996).

4.3.2 Electoral Boundaries: Prepare and verify electoral riding maps and descriptions.

4.3.3 Provincial and Territorial Boundaries: Deal with provincial and territorial boundary issues, as they arise.

4.3.4 Marine Boundaries and Geoscience Surveys: Conduct marine geoscience surveys to provide input to decisions about offshore resources, including Law of the Sea boundary determination.

4.4 Property Rights and Surveys:

Maintain a national centre for facilitating flexible and adaptable property rights infrastructures that utilize the Canada Lands Survey System. In the role of corporate surveyor for the federal government, regulate all surveys and manage the survey programs of the administering department on Canada Lands.

4.4.1 Adapting the CLSS to Individual Needs: Develop options within the Canada Lands Survey System that are adaptable to the individual needs and cultural notions of land and land tenure of Aboriginal and northern communities and other users of the system, and promote integration of the various components of a property rights infrastructure.

4.4.2 Canada Lands Survey Records: Maintain the Canada Lands Survey Records to archival standards and provide online access.

4.4.3 Canada Lands Survey System: In partnership with the Association of Canada Lands Surveyors, promote and enhance the Canada Lands Survey System and its outreach to users.

4.4.4 Land Administration and Management: Provide professional advice and consultation to land administrators and system users. Manage the survey programs of INAC and Parks Canada.

4.5 Navigation:

Facilitate access to reliable and consistent reference frames for positioning and reliable charts and publications for aviation.

4.5.1 Aeronautical Products: Develop digital versions of printed aeronautical products following the internationally agreed revision cycle of 56 days.

4.5.2 Canadian Spatial Reference System: Promote the Canadian Spatial Reference System and its adoption by non-traditional users as the national standard for positioning to ensure efficient integration of spatially referenced data and reliable navigation from different georeferenced databases.

ESS GOAL 5: Ensure that the Earth Sciences Sector is a forward-looking, rewarding, and effective and efficient workplace, and that it meets the needs of its clients.

5.1 Leadership:

Provide direction and leadership for Earth Sciences Sector programs and operations in order to contribute to departmental and national activities and policies, with respect to national needs and concerns.

5.1.1 Strategic and Management Improvement Plans: Implement and monitor the ESS Strategic and Management Improvement Plans.

5.1.2 ESS Goals and Objectives: Communicate the strategic direction, goals and objectives of ESS to staff, clients, partners and stakeholders.

5.1.3 Organizational Culture: Promote an organizational culture in which teamwork, open communication, shared leadership and quality practices are valued and rewarded.

5.2 Human Resources:

Foster an environment for Earth Sciences Sector staff to encourage employees to reach their full potential, participate in decision-making processes, and inspire staff to fulfill the Sector's goals and objectives.

5.2.1 The 3Rs Strategy: Implement the "Recruitment-Rejuvenation-Retention" (3Rs) Strategy to fashion an effective, flexible and motivated workforce, address equity representation and management development, and ensure transfer of knowledge and experience to new staff through mentoring and coaching.

5.2.2 The STEP Program: Promote the Science and Technology Enhancement Program (STEP) to encourage strengthened interaction and synergy within the geoscience and geomatics communities in Canada, including other government departments, universities, industry and the international community.

5.2.3 Employee Surveys: Conduct employee surveys every two years to assess employee satisfaction and to provide input into continuous improvement of ESS.

5.3 Clients and Stakeholders:

Continue to align the deliverables of the Earth Sciences Sector with the needs and expectations of clients and stakeholders, as required and feasible.

5.3.1 Quality Systems: Maintain client-focused quality systems to meet clients' changing needs, including ISO 9000 systems.

5.3.2 Networking with Stakeholders: Network with all sectors of the geoscience and geomatics community to ensure the relevancy and effectiveness of ESS.

5.3.3 National and International Participation: Actively participate in the national and international science and national business communities to present and promote ESS capabilities and opportunities.

5.3.4 Access to the ESS Information Infrastructure: Invest in the ESS information technology infrastructure to ensure that its data, information and knowledge products are accessible to clients in a timely fashion.

5.3.5 Strategic Communications: Implement a Strategic Communications Plan, including a public-oriented outreach program, to promote awareness of ESS activities.

5.4 Suppliers and Partners:

Develop relations with suppliers and partners, and leverage capacity.

5.4.1 Developing Partnerships: Develop partnerships to optimize capacities, leverage resources and avoid duplication.

5.4.2 User Access to Information and Services: Collaborate with partners toward building user-friendly access to Canadian information and services through the Internet.

5.4.3 Access to Facilities: Increase the accessibility of ESS facilities, through building partnerships to make them a national resource, where appropriate.

5.4.4 Supplier Relations: Work with suppliers to minimize cost and maximize benefits of goods and services supplied to ESS.

5.5 Planning:

Align the Earth Sciences Sector's planning activities and practices for its programs and their delivery with its strategic goals and priorities.

5.5.1 Business Planning: Produce annual Sector and Divisional Business Plans.

5.5.2 The Proposal-driven Sector Project System (SPS): Implement a proposal-driven funding process for the science and technology program activities within the Geological Survey of Canada.

5.5.3. Project Management Standards: Ensure that all projects meet the ESS standard for project management processes.

5.6 Process Management:

Improve effective and efficient administration and processes for delivering programs, products and services.

5.6.1 **Modernization of Comptrollership:** Support financial services initiatives that will enable the Sector to modernize comptrollership.

5.6.2 **Common Sector Business Practices:** Provide a common framework for consistent business practices across ESS.

5.6.3 **Management of the Revolving Fund:** Manage the Geomatics Canada Revolving Fund to take full advantage of its financial capabilities.

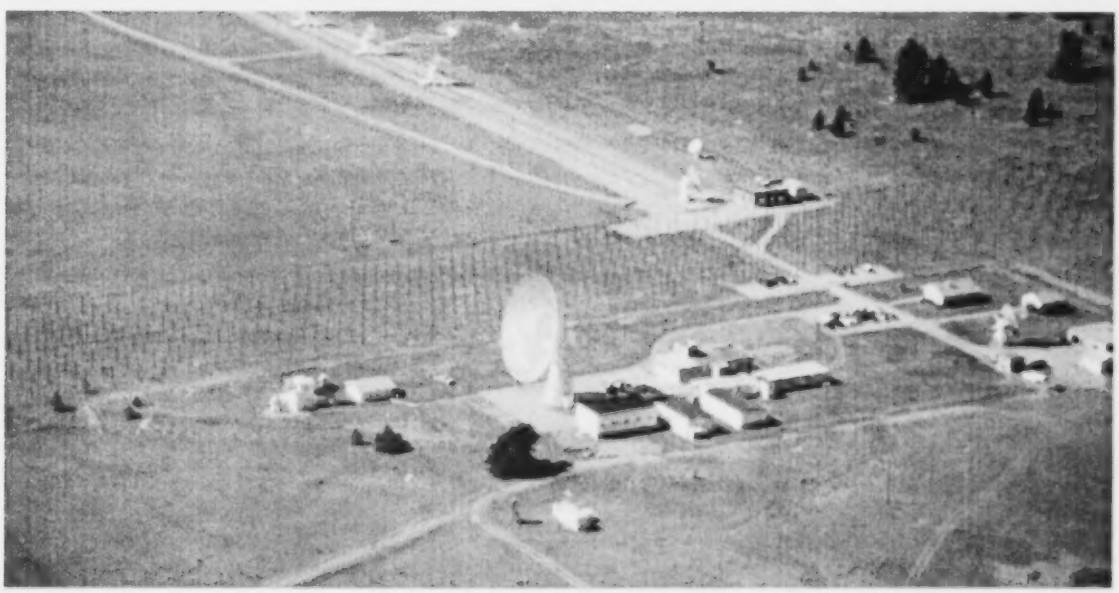
5.6.4 **Trends and Opportunities:** Identify and respond to emerging trends and opportunities in government priorities and client needs, in cooperation with the Minister's National Advisory Board on Earth Sciences and other external advisory, client and stakeholder groups.

5.7 Performance Reporting:

Report on performance in delivery of programs, products and services, for accountability to all clients, in support of continuous improvement.

5.7.1 **Internal and External Reviews:** Conduct internal and external reviews to monitor and ensure continuous improvement, including external review of at least one major ESS science and technology program per year.

5.7.2. **Impact Studies:** Measure and communicate the economic and societal impact and value of Sector programs and activities, in cooperation with NRCan's Audit and Evaluation Branch.



Earth Sciences Sector Links to Natural Resources Canada Goals

The following section illustrates the close link between NRCan's goals, as described in the department's 2000-2001 Report on Plans and Priorities, and those of the Sector.

NRCan Policy Goal 1: To enable Canadians to make balanced decisions regarding natural resources.

NRCan's role is to contribute to the resource development decisions of federal and provincial governments as well as industry and consumers. It does this by creating the knowledge, mechanisms and policy climate for decision-making on natural resource issues.

ESS Goal 1: Provide geospatial and geoscientific knowledge on Canada for sound economic, environmental and social decisions.

ESS assists NRCan in achieving this goal by creating an easily accessible and integrated knowledge infrastructure, promoting cooperation and consensus on sustainable development issues, and developing and promoting approaches that encourage and maintain sustainable development and use of natural resources. ESS provides positioning, geographic and geoscience knowledge, as well as resource assessments and a cadastral survey framework.

NRCan Policy Goal 2: To sustain the economic and social benefits derived from natural resources for present and future generations.

To maintain a healthy economy while protecting the environment, we must make the most efficient use of natural resources. Sustainable development is grounded in the reality that we must maintain our ability to compete on world markets and have assured access to those markets if Canadians are to continue to enjoy a high standard of living.

To sustain the benefits from the development and use of natural resources, NRCan is involved in the areas of growth and investment, trade and markets, and communities.

ESS Goal 2: Provide geospatial and geoscientific knowledge to help develop and sustain economic and social benefits.

The natural resources sector is a cornerstone and principal driver of Canada's economy integral to the trade balance, job creation and community development. Through the work of NRCan and ESS, natural resource-based industries will, in future, make fewer demands on the environment, create economic and social opportunities in Canada and abroad, remain competitive, and provide greater stability to Canadian Aboriginal and rural communities.

ESS supports Canadian industry by helping companies gain access to international markets and successfully compete for contracts. The Sector also supports northern research, and assists rural, remote and Aboriginal communities.

NRCan Policy Goal 3: To manage the environmental impacts of natural resource development and use.

The environment is constantly undergoing change as a result of natural processes and human activity. It is imperative that natural resources be developed and used in such a way that natural ecosystems are able to adapt and renew themselves. In this respect, NRCan plays a role in monitoring climate change, reducing environmental impacts and safeguarding Canadians.

ESS Goal 3: Provide geospatial and geoscientific knowledge to minimize the impacts of land use, natural resource development and climate change.

In its role, ESS must help design Canada's response options for climate change, which are central to the federal government's mitigation and adaptation strategy. The Sector plays a role in climate change studies and environmental stewardship issues and actively promotes S&T as well as environmentally friendly stewardship practices.

NRCan Policy Goal 4: To contribute to the safety and security of Canadians.

Safeguarding Canadians from natural hazards and securing our territorial and economic sovereignty requires an increasingly detailed knowledge of Canada, its resources and a supporting policy framework.

ESS Goal 4: Provide geospatial and geoscientific knowledge to enhance the safety and economic security of Canadians.

ESS has a primary role to play in acquiring, maintaining and distributing information and knowledge about the earth. This includes information on seismic activity and other natural hazards, national and international boundaries, the system of land and geodetic surveys, and aeronautical charting to support the safe and efficient operation of the Canadian aviation industry. ESS products and services include the boundary component of the property rights infrastructure that encompasses the regulation of all surveys on Canada Lands; the management of surveys for government departments administering surveys; and the maintenance and depiction of the international boundary between Canada and the U.S. The Sector also provides aeronautical charts, topographical maps for search and rescue-related activities as well as emergency planning and response.

NRCan Policy Goal 5: To manage the department efficiently and effectively.

NRCan is committed to good governance and the sustainable development of Canada's natural resources. To implement this agenda, we must make flexibility an integral part of our corporate culture and structures. Today's dynamic of continual change gives rise to management and organizational challenges and issues that need to be identified and properly managed.

ESS Goal 5: Ensure that the Earth Sciences Sector is a forward-looking, rewarding, and effective and efficient workplace, and that it meets the needs of its clients.

ESS is committed to good governance and the sustainable development of Canada's natural resources. To meet this commitment, the Sector must make flexibility an integral part of its corporate culture and structure. The challenge of allocating scarce resources and achieving a better return for the money it spends is leading ESS to search for innovative approaches to management and accountability. ESS must strive for continuous improvement in its products, services and operations. Goal 5 is based on the NRCan Guide to Good Management and the NRCan S&T Management Framework. Priorities are set each year in the ESS Management Improvement Plan (MIP), which is a component of the ESS Business Plan. The MIP focuses on seven areas: leadership, human resources, clients and stakeholders, suppliers and partners, planning, process management and performance reporting.

Earth Sciences Sector Funding by Goal

Beginning in the 2000/2001 fiscal year, ESS will begin financially reporting on its activities by Sector goal. Below is a summary of projected total funding, from all mechanisms, by goal. Financial information for Goal 5 is not distinguished because these funds and already included in Goals 1 to 4. A break down of total funding, by ESS objective, appears in the planning tables that follow.

Earth Sciences Sector Total Funding by Goal

	2000/2001	2001/2002	2002/2003
Goal 1	111 237	110 052	109 820
Goal 2	47 445	45 349	45 168
Goal 3	12 498	12 476	12 477
Goal 4	23 173	23 892	23 995
Total ($000)	**194 353**	**191 769**	**191 460**

Performance Measurement

The following tables describe the planned activities of the Sector for the 2000/2001 to 2002/2003 fiscal years. They present information in four columns: the first column describes the planned activities and outputs for 2000/2001 (Year 1); the second column describes the planned activities and outputs for 2001/2002 and 2002/2003 (Years 2 and 3); the third column, entitled "reach," names beneficiaries, clients, partners and stakeholders—those involved in, reached by, and influenced by the ESS activities; and the fourth column describes expected short- and long-term results. The information presented in the tables reads from left to right across the columns.

To improve accountability, a separate table of performance measures was added to the format of this year's business plan. The table of performance measures pertains to the columns of information presented above, and does not necessarily read from left to right. The Sector has identified a range of measures, including those pertaining to the products and services it produces; those pertaining to the extent of its involvement with beneficiaries, clients and partners; and those pertaining to the results it ultimately achieves. Although many qualitative and quantitative measures have been identified for the Sector, not all aspects have measures.

Accountability Centres

Information in the tables is identified numerically by accountability centre. This year's plan mentions two ESS initiatives as accountability centres—ESS ResSources and the Canada–Nunavut Geoscience Office (C-NGO). These are included in this year's planning tables to profile and raise awareness of these initiatives.

The following accountability centres are represented in the planning tables:

1. GSC Atlantic
2. GSC Quebec
3. GSC Calgary
4. GSC Pacific
5. Terrain Sciences Division
6. Continental Geoscience Division
7. Mineral Resources Division
8. Geodetic Survey Division
9. Legal Surveys Division and International Boundary Commission
10. Canada Centre for Remote Sensing
11. Mapping Services Branch
12. Polar Continental Shelf Project
13. Business Development Office
14. Policy, Planning and Coordination Division
15. Geoscience Information Division
16. Quality Management Advisor
17. Human Resources Advisor
18. Management and Administrative Services Division
19. ESS Communications
20. Chief Geoscientist Office
21. *Canada–Nunavut Geoscience Office (C-NGO)*
22. *ESS ResSources*

Planning Tables

ESS Goal 1: Provide geospatial and geoscientific knowledge on Canada for sound economic, environmental and social decisions.

Objective 1.1: **Positioning Knowledge: Maintain and enhance the geodetic infrastructure and the knowledge base for the national standard for spatial referencing and positioning in Canada.**

Objective 1.1: **Positioning Knowledge**

Strategy 1.1.1: Canadian Spatial Reference Standard

Strategy 1.1.2: Global Standards

Earth Sciences Sector
Total Funding by Objective
($ 000)

ESS GOAL 1		2000/2001	2001/2002	2002/2003
1.1	Positioning Knowledge	7 707	7 703	7 703
1.2	Geographic Knowledge	31 344	30 295	30 217
1.3	Geoscience Knowledge	29 240	28 959	28 963
1.4	Cadastral Survey Framework	1 795	1 796	1 796
1.5	Resource Assessments	2 581	2 855	2 728
1.6	Knowledge Access and Management	38 570	38 444	38 413

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Enhance, maintain and deliver the Canadian Spatial Reference System (CSRS) as a globally consistent national standard using active control technologies, gravimetry and advanced geodetic concepts. (8,22) Improve the accuracy and delivery of Canadian Active Control System (CACS) services. (8,22) Maintain links with national R&D programs, international services and foreign government institutions in geomatics and global dynamics. (8) Participate in international space geodetic and gravity services and networks to maintain and enhance international terrestrial reference system standards and global geodynamics. (8,22) Participate in the collaborative development of a consistent North American spatial reference frame. (8) Improve the geoid model to facilitate use of the Global Positioning System (GPS) for height determination, particularly in remote regions of Canada. (8)	All Year 1 activities are ongoing, with some thrusts as noted. Research and develop techniques and applications related to space-based positioning, geoid modelling and Very Long Baseline Interferometry (VLBI). (8) Investigate global real-time operations interfaces. (8,22) Put Canada-wide integrated networks in place for precise applications. (8,22) Initiate testing and development for integration of geodetic techniques. (8)	Beneficiaries The Canadian positioning community, provincial and territorial agencies, other government departments (OGDs), universities, international agencies and collaborators. (8) Partners Provincial and territorial governments, universities and stakeholders. (8) Stakeholders The International Earth Rotation Service (IERS), International VLBI Service (IVS), International GPS Service (IGS), International Geoid Service (IgeS), International Gravity Bureau (IGB), and Global Geodynamics Project (GGP). (8)	A globally consistent infrastructure, providing direct access to the standard of the CSRS for positioning and related multi-disciplinary applications, is available in post processing and real time. (8) Global geodetic positioning and precise real-time georeferencing and navigation are improved over the Canadian landmass and adjacent regions. (8) Direct access to best realization of the inertial reference frame is provided through global collaboration. (8) Efficient three-dimensional positioning over Canada is ensured. (8) Horizontal, vertical and gravity control networks and databases are integrated. (8) Calibration standards and specifications for geodetic and gravity surveys are upgraded. (8) GPS is accepted and increasingly used for elevations above sea level. (8) Access to and consistency with evolving global reference frames is maintained. (8)

Planning Tables

ESS Goal 1: Provide geospatial and geoscientific knowledge on Canada for sound economic, environmental and social decisions.

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Objective 1.1: Positioning Knowledge

Strategy 1.1.1: Canadian Spatial Reference Standard (continued)

Strategy 1.1.2: Global Standards

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
			A consistent solution for the North American reference frame is developed. (8)
↑	↑	**Performance Measures** ↑	↑
Maintenance of an accurate and consistent national spatial reference framework. (8)		Consultation with the Canadian Geodetic Reference System Committee for Geodetic Survey Division (GSD) and CSRS initiatives. (8) Participation in global collaborations. (8)	Availability of an ITRF-based reference system and related products of coordinates, velocities, orbits, clocks, as well as data for enhancement of the geoid and related orthometric height system. (8) Availability of efficient, globally consistent 3-D positioning, with an accuracy of less than one metre in real time and less than three centimetres over Canada with post-processing. (8) Acceptance of GPS, VLBI and gravity data from Canadian stations by international programs. (8)

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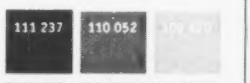
Earth Sciences Sector Total Funding by Objective ($ 000)



ESS GOAL 1		2000/2001	2001/2002	2002/2003
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1.5	Resource Assessments	2 581	2 855	2 728
1.6	Knowledge Access and Management	38 570	38 444	38 413

Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
All Year 1 activities are ongoing, with some thrusts as noted. Research and develop techniques and applications related to space-based positioning, geoid modelling and Very Long Baseline Interferometry (VLBI). (8) Investigate global real-time operations interfaces. (8,22) Put Canada-wide integrated networks in place for precise applications. (8,22) Initiate testing and development for integration of geodetic techniques. (8)	Beneficiaries The Canadian positioning community, provincial and territorial agencies, other government departments (OGDs), universities, international agencies and collaborators. (8) Partners Provincial and territorial governments, universities and stakeholders. (8) Stakeholders The International Earth Rotation Service (IERS), International VLBI Service (IVS), International GPS Service (IGS), International Geoid Service (IgeS), International Gravity Bureau (IGB), and Global Geodynamics Project (GGP). (8)	A globally consistent infrastructure, providing direct access to the standard of the CSRS for positioning and related multi-disciplinary applications, is available in post processing and real time. (8) Global geodetic positioning and precise real-time georeferencing and navigation are improved over the Canadian landmass and adjacent regions. (8) Direct access to best realization of the inertial reference frame is provided through global collaboration. (8) Efficient three-dimensional positioning over Canada is ensured. (8) Horizontal, vertical and gravity control networks and databases are integrated. (8) Calibration standards and specifications for geodetic and gravity surveys are upgraded. (8) GPS is accepted and increasingly used for elevations above sea level. (8) Access to and consistency with evolving global reference frames is maintained. (8)

Objective 1.1: **Positioning Knowledge**

Strategy 1.1.1: Canadian Spatial Reference Standard (continued)

Strategy 1.1.2: Global Standards

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
			A consistent solution for the North American reference frame is developed. (8)
↑	↑	**Performance Measures** ↑	↑
Maintenance of an accurate and consistent national spatial reference framework. (8)		Consultation with the Canadian Geodetic Reference System Committee for Geodetic Survey Division (GSD) and CSRS initiatives. (8) Participation in global collaborations. (8)	Availability of an ITRF-based reference system and related products of coordinates, velocities, orbits, clocks, as well as data for enhancement of the geoid and related orthometric height system. (8) Availability of efficient, globally consistent 3-D positioning, with an accuracy of less than one metre in real time and less than three centimetres over Canada with post-processing. (8) Acceptance of GPS, VLBI and gravity data from Canadian stations by international programs. (8)

Objective 1.2: Geographic Knowledge: Provide reliable, up-to-date geographic information and services.

Objective 1.2: Geographic Knowledge

Strategy 1.2.1: Access to Geospatial Information

Strategy 1.2.4: Integrated Data Through Partnerships

Strategy 1.2.6: Integrated Geospatial Information Products

Deliverables Year 1	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Identify needs of partners, users and potential groups. (10)	Ongoing. (10)	Federal departments and agencies, provincial and territorial agencies, research centres, universities, Canadian geospatial data producers, technology companies, geomatics service providers, Aboriginal, rural and northern communities, the public sector and schools. (10)	Canadian geospatial databases are connected. (10)
Develop national framework data themes in partnership with federal and provincial agencies. (10)	Ongoing. (10)		The size of the national framework increases. (10)
Develop web-based geospatial services for data discovery, evaluation and access, with protocols and links to international standards. (10)	Ongoing. (10)		Canadian geomatics technology and geospatial databases are developed that reflect international standards. (10)
Build community use of geo-spatial data in Aboriginal, rural and northern areas. (10)	Ongoing. (10)		Investments made by other levels of government and industry increase.(10)
Provide online national perspectives on geospatial information for students and the public. (10)	Ongoing. (10)		Harmonized policies are in place. (10)
Provide opportunities for Canadian industry to contribute to national and international programs. (10)	Ongoing. (10)		GeoConnections geospatial information is accessed and used for effective decision-making. (10)
			GeoConnections-related geomatics grows in the industrial sector. (10)
Develop applications to use earth observation (EO) data for land-use change mapping and to map salvageable lumber from burned areas. (10)	Develop applications to integrate geospatial data with EO data from several sources. (10)	Canadian industry. (10)	Canadian industry uses high-spatial-resolution satellite data for commercial and large-scale cartographic applications. (10)
Develop geospatial frameworks to facilitate access to present *in situ* data networks. (10)	Develop infrastructure, data access, standards and protocols in support of *in situ* activities. (10)	OGDs, provinces and industry. (10)	Information derived from EO data is used for forest management and national reporting, as well as improved general circulation models. (10)
Integrate EO-based climate change information into the Canadian Geospatial Data Infrastructure (CGDI) and the National Atlas of Canada. (10,22)	Implement two *in situ* demonstration projects with external partners. (10)	International governments, provincial governments and individual farmers. (10)	More appropriate representations and improved data for modelling social, economic and environmental issues are developed. (10)

Objective 1.2: Geographic Knowledge

Strategy 1.2.1: Access to Geospatial Information (continued)

Strategy 1.2.4: Integrated Data Through Partnerships

Strategy 1.2.6: Integrated Geospatial Information Products

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
	Develop an international hyperspectoral partnership to integrate hyperspectoral data for precision farming. (10)	National and international users, including government, academia and industry. (10)	Data sets are used to add valuable context to discussions about Canadian resource and environmental issues in national and international settings. (10)
	Add key NRCan data themes to small-scale databases (target is two themes, possibly surficial geology map and forests). (10,22)	OGDs, international governments and academia. (10)	
Complete a rigorously structured small-scale database of Canada, incorporating most base map features, for release on GeoGratis. (10,22)	Generalize features to small scale for use in the National Atlas of Canada. (10,22)		

Performance Measures

Number of themes being developed. (10)	Meeting of demonstration targets. (10)	Dollar value of leveraged investments by stakeholders at all levels. (10)	Number and type of databases connected on an ongoing basis. (10)
Number of applications developed. (10)	Addition of frameworks to the low-density geospatial database. (10)	Number and type of geospatial information users. (10)	Investments and project activities. (10)
Public release of a new small-scale national database on GeoGratis. (10)	Meeting of target for adding data themes to databases. (10)	Number of framework data themes developed in partnership with the direct participation of provincial and other federal agencies. (10)	Degree of integration with international standards. (10)
Publication of a map of northern Canada derived from the small-scale database. (10)	Publication of new maps of North America and the world. (10)	Number of Canadian industries adopting applications developed with Canada Centre for Remote Sensing (CCRS) involvement. (10)	Degree of user satisfaction with geospatial data, information and accessibility. (10)
			Expenditures, sales, and job created in the industrial sector. (10)
			Number of applications adopted by industry. (10)
			Information about the use of data sets in decision making. (10)

Objective 1.2: Geographic Knowledge

Strategy 1.2.2: Information Dissemination Through GeoConnections

Deliverables Year 1	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Implement a new rapid cartographic map revision production system. (11)	Ongoing. (11)	The public and private sectors. (11)	The rate of map revisions is increased. (11)
Elaborate cartographic mapping production specifications. (11)		Private sector contractors. (11)	A new specification guide for map products is published. (11)
Benchmark contractors according to operational specifications. (11)	Ongoing. (11)	Private sector contractors. (11)	A database of qualified contractors is developed. (11)
Seek National Topographic System (NTS) specific data agreements. (11)	Ongoing. (11)	Provinces, territories and the private sector. (11)	NTS data are updated. (11)
Publish 250 new raster maps and convert 400 paper maps to raster files. (11)	Publish 400 new or revised raster maps and convert 200 paper maps to raster files. (11)	Public and private sector clients. (11)	Clients are satisfied. (11)
Conduct a socio-economic impact study of paper maps. (11)		ESS, public and private sector clients. (11)	Client priorities are better understood. (11)
Complete ISO registration for the Centre for Topographic Information (CTI). (11)	Maintain ISO registration. (11)	ESS, public and private sector clients. (11)	Process control and visibility for ESS is improved. (11) Support is provided to industry in international contracts. (11)
Provide cartographic imaging and printing services for the Government of Canada. (11)	Ongoing. (11)	The Government of Canada's aeronautical, geographic, geological, hydrographic and topographic mapping agencies. (11)	Client requirements are met. (11)
↑	↑	**Performance Measures** ↑	↑
Implementation of production system. (11) Publication of specifications. (11) Meeting of publishing and conversion targets. (11) Number of maps imaged. (11) Number of maps printed. (11)		Number of NTS-specific data agreements with the public and private sector. (11) Number of qualified contractors. (11) Volume of work done for each client agency. (11)	Number of maps revised annually (250 maps in 2000/2001and 400 maps per year thereafter). (11) Client feedback on product quality. (11) Evidence that funding levels have been adjusted in response to impact study results. (11) Percentage of work delivered per agreed client requirements. (11) Utilization rates of the printing presses that are "in line" with industry benchmarks (70 percent). (11)

Objective 1.2: Geographic Knowledge

Strategy 1.2.3: National Topographic Data Base

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Sign agreements to produce a complete national Landsat-7 ortho-image. (11,22) Start production of Landsat-7 images through the private sector. (11,22)	Update images of Canada using available Landsat-7 images and Landsat-5 images for the remainder (complete years 2 and 3 of the five-year project). (11,22)	Federal departments, and provincial and territorial governments. (11) Private sector partners. (11)	A complete national Landsat-7 ortho-image of Canada is available at low cost. (11) Basic data are now available for areas of northern Canada where almost no digital topographic data were previously available. (11)
Revise topographic data sets using technical specifications for the new topographic database (Topograf). (11)	Ongoing. (11)	All users of geomatics digital information in Canada. (11) Users of the new Topograf database. (11)	Improved digital topographic information is available. (11) New applications using Topograf are created. (11)
Update and upgrade the road network theme of the national topographic coverage in the Yukon, N.W.T. and Quebec. (11,22)	Complete the upgrading of the road network theme of the national topographic coverage by the end of 2003. (11,22)	NTDB users, provincial mapping agencies and the private sector. (11)	Accuracy of the road network theme of the NTDB is improved. (11) Cooperation on data maintenance of 1: 250 000 data and creation of new 1: 50 000 data themes is established and maintained. (11) Duplication in data collection is minimized. (11)
Design and build prototypes of the new topographic database (Topograf). (11,22)	Use prototypes for data distribution activities. (11,22)	Digital topographic information users in Canada, such as federal departments and the private sector. (11)	Direct access to up-to-date topographic digital information is provided. (11)
Begin loading information related to the road network into Topograf. (11)	Continue loading up-to-date topographic information on important themes. (11) Prototype a direct link to Topograf subscribers. (11)		Easier access and more recent topographic data are available for decision-making. (11) Less expensive topographic information is available. (11)
Continue developing the Vector Map level 1(VMAP1) product: Vector Smart Map from the National Topographic Data Base (NTDB). (11)	Complete the development of Vector Smart Map. (11)	The Department of National Defence (DND), and Canadian private sector contractors. (11)	Canada meets its international military mapping commitments at the lowest cost. (11) Content and structure of the 1:250 000 NTDB are improved. (11)
Establish VMAP1 libraries (target is nine). (11,22)	Finish establishing VMAP1 libraries (target is 21 by 2003). (11,22)	ESS, and Canadian private sector contractors. (11)	National topographic coverage of Canada is available to civilian users in the internationally adopted VMAP military format. (11)

Objective 1.2: Geographic Knowledge

Strategy 1.2.3: National Topographic Data Base (continued)

↑	↑ Performance Measures ↑		↑
Number of agreements signed. (11) Delivery of the first ortho-image data sets to partners by March 2001. (11) Data upgrading activities throughout the country. (11) Completion of updates and upgrades to the road network theme. (11) Implementation of NTDB prototypes at scales of 1:50 000 and 1:250 000 in 2000. (11) VMAP1 coverage of 50 percent of Canada's territory. (11) Meeting of target for VMAP1 libraries. (11)	Number of ortho-images produced through the private sector. (11) Complete coverage of Canada with ortho-images by March 2003. (11) Meeting of production target. (11) Distribution of digital topographic information by extracting data from new prototypes in 2001. (11) Connection of first clients to Topograf by 2002. (11) Completion of Vector Smart Map. (11) Meeting of target, and libraries' compliance with DND criteria. (11)	Percentage of OGDs, and provincial and territorial governments, that have signed agreements. (11) Number of users of the new ortho-image coverage of Canada. (11) Number of Topograf users. (11) Number of users. (11) Percentage of provincial mapping agencies upgrading their data. (11) Number of clients accessing data directly. (11) Number of civilian users accessing topographic information in the new internationally adopted military format. (11)	Complete coverage of the most important themes by 2005. (11) Client feedback about digital topographic information revised using Topograf. (11) Number of new applications created using Topograf. (11) Availability of up-to-date road network information, throughout the country, for Geographic Information System (GIS) applications. (11) Savings realized on data purchasing and pre-processing. (11) Feedback from users about savings realized from transferring, processing and having access to the most up-to-date information. (11) Client feedback about the NTDB. (11)

Objective: 1.2 Geographic Knowledge

Strategy 1.2.5: High-resolution Satellite Data

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Conduct research in advanced change detection, feature recognition and data fusion using satellite imagery. (11)	Ongoing. (11)	Universities, the private sector, ODGs, provinces and territories. (11)	Rate of map revisions increases. (11) New products are developed. (11)
↑	↑ Performance Measures ↑		↑
Use of the automated road network extraction methodologies. (11)	Use of other features. (11)	Number and value of partnership agreements. (11)	Number of maps produced annually. (11)

Objective 1.2: Geographic Knowledge

Strategy 1.2.7: Global Positioning System Correction System

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Establish real-time distribution of GPS Corrections (GPS•C) in collaboration with partners. (8,22) Enhance GPS•C for operational mode readiness and distribution. (8)	Continue collaborative management, development and distribution of GPS•C. (8,22) Maintain and enhance GPS•C in accordance with technological advances and evolving user needs. (8)	The national GPS•C distributor partnership (provincial geodetic agencies, the Department of Fisheries and Oceans (DFO), the Canadian Council on Geomatics, GeoConnections, Government Telecommunications and Informatics Services, the Communications Research Centre), communication and GPS industries. (8) Beneficiaries The Canadian GPS positioning community in government, industry, academia and the public sector. (8)	GPS•C is accessible across the country and beyond in 2001. (8) Positioning is available as a public utility. (8) Collaborative management and funding of GPS•C distribution is initiated. (8) Clients and stakeholders develop value-added products and services. (8) Access to enhanced GPS positioning is provided in real time seamlessly across Canada with respect to the national spatial reference system. (8)
↑	↑ **Performance Measures** ↑		↑
Preparation of real-time GPS Corrections for distribution. (8)	Broadcast of GPS Corrections. (8)	Extent of provincial, federal and territorial collaboration for initial distribution of GSD's Real-Time GPS Corrections. (8)	Accessibility of GPS•C across the country and beyond in 2001. (8)

Objective 1.3: Geoscience Knowledge: Develop new updated geoscience data, information, synthesis products and advanced knowledge of earth science processes for incorporation in a consistent and accessible geoscience knowledge base.

Objective 1.3: Geoscience Knowledge

Strategy 1.3.1: Establishing Geoscience Mapping Priorities

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Complete bedrock field studies and publish the preliminary results from the Ancient Pacific Margin NATMAP project. (4)	Create a stratigraphic and tectonic portrait and define the metallogeny of the pre-collisional western North American margin (Ancient Pacific Margin NATMAP project). (4)	Partners The U.S. Geological Survey (USGS), the Yukon Geology Program, the University of Alberta, the University of British Columbia (UBC), the B.C. Geological Survey (BCGS), Career Edge Canada and mineral exploration companies. (4) The U.S. National Science Foundation (Lawrence Livermore Lab) and the Yukon Placer Miners Association. (4)	Resources from several agencies are focused on a single problem. (4) New models to guide exploration strategies along the length of the Cordillera are provided. (4)
Release bedrock maps, reports and GIS compilations of the current year's field studies from the Western Superior National Geoscience Mapping Program (NATMAP) project (integrated with Western Superior Lithoprobe data). (6)	Complete the Western Superior NATMAP project and release the final results. (6)	Partners Manitoba (the Manitoba Geological Services Branch [MGSB]), Ontario (the Ontario Geological Survey), four universities, one European university and five mineral exploration companies. (6)	Understanding of regional geology and tectonic history in areas of significant resource potential (Western Superior, South Baffin) improves. (6)
Complete the South Baffin bedrock project by publishing the final geoscience synthesis in *GSC Bulletins*. (6)		Nunavut, GEOTOP (a consortium of geomatics companies), universities (Queen's, University of New Brunswick) and mineral exploration companies (Cominco, BHP). (6)	Mineral exploration in regions of northwestern Ontario and adjacent Manitoba is increased and expanded. (6)
↑	↑ **Performance Measures** ↑		↑
Delivery of NATMAP projects on time and within budget. (4,6)	Number of maps on Open File. (4,6)	Number of requests for repeat business from collaborators. (4,6) Amount of academic collaboration. (4,6) Number of formal provincial collaborations. (4,6)	Information about private sector use of GSC reports to increase levels of mineral and hydrocarbon exploration. (4,6) Sales of Open Files. (4,6) Number of gaps identified in the geoscience map coverage. (4,6)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.2: Mapping Canada's Water Resources

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Release a methodology for hydrogeology mapping in granular aquifers. (2) Release reports and models for the hydrogeology project in the Laurentian region of Quebec and initiate a study on aquifer recharge. (2) Initiate the Maritimes Carboniferous Basin project. (2)	Complete final reports and models for the southwestern Quebec rock aquifers and Maritimes projects by 2003. (2)	Provinces, federal policy makers, Environment Canada (EC), Agriculture and Agri-Food Canada (AAFC), the International Joint Commission, OGDs, urban planners and municipalities. (2,3,5,7)	Understanding of major aquifers is enhanced to help relevant authorities address national and international water supply and protection issues. (2,3,5,7)
Develop the Prairie Groundwater initiative. (3,5)	Implement the Prairie Groundwater project. (3,5)	MGSB, Manitoba Water Resource Branch, the Prairie Farm Rehabilitation Administration, Sask. Water, the Saskatchewan Research Council, Alberta Geological Survey, Alberta Environment, AAFC, EC, the Prairie Adaptation Research Cooperative, the Nova Scotia Department of Natural Resources and the Nova Scotia Department of the Environment. (3,5)	
Construct and interpret 4-D models of the geological architecture and hydrogeology of the Greater Toronto Area. (5)	Complete the Oak Ridges Moraine hydrogeology project. (5)	Provinces, municipalities, land-use planners, federal policy makers, environmental groups and power utilities. (5)	Decisions about groundwater removal are guided by an understanding of resource adequacy. (5)
Complete final reports and models for mapping granular aquifers in southern Manitoba. (3,5,7)	Complete the Winnipeg hydrogeology project. (5)		

↑	↑ Performance Measures ↑	↑
Delivery of hydrogeology projects on time and within budget. (2,3,5,7)	Number of requests for repeat business from collaborators. (2,3,5,7)	

Objective 1.3: Geoscience Knowledge

Strategy 1.3.3: Geoscience Mapping Techniques and Standards

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Continue release of Maritimes Basin electronic compilation products. (1,22)	Release Open Files (electronic) for reservoir parameters and map information on the Internet. (1,22)	Provinces, the oil and gas industry, OGDs and academia. (1)	Gaps in the geoscience map coverage of Canada are identified. (1)
↑	↑ Performance Measures ↑		↑
	Number of maps on Open File. (1)	Number of formal provincial collaborations. (1)	Sales of Open Files. (1) Number of gaps identified in the geoscience map coverage. (1) Number of digital data sets donated to ESS by the oil and gas industry. (1)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.4: Partnered Thematic Mapping

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Investigate subsurface geoscience of the continental slope work plan in conjunction with industry research partners. (1)	Ongoing. Finish compiling subsurface geological and geophysical data and publish initial reports and maps on Mesozoic and Cenozoic stratigraphy. (1)	The oil and gas industry, provinces, territories and OGDs. (1)	Government policy and land-use decisions are informed by relevant geoscience knowledge, as are decisions on the sustainable development of renewable and non-renewable marine resources. (1)
Produce geophysical maps of the Labrador Sea/Davis Strait study area. (1)	Work jointly with Nunavut and the Geological Survey of Denmark and Greenland (GEUS) to complete four geological and geophysical maps. (1)	Territories, industry and OGDs. (1)	Identified gaps in the geoscience map coverage of Canada are filled to ensure competitiveness for global exploration investment. (1)
Pursue Geological Survey of Canada (GSC) contribution in igneous petrogenesis and geochemistry to MRN's (Ministère des Ressources naturelles) Grand Nord project. (2)	Finalize outputs for MRN's Grand Nord project. (2)	Provinces and academia. (2)	Geoscience mapping is done more efficiently and effectively due to increased integration and application of new technologies and standards. (2)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.4: Partnered Thematic Mapping (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Complete maps and reports on surficial geology studies from NATMAP projects in New Brunswick, the Laurentian region, northern Quebec, Winnipeg, Nunavut (Western Churchill), Shield Margin, southern Alberta/ British Columbia (B.C.) (Foothills), eastern and central Cordillera (Central Foreland, Ancient Pacific Margin) and central B.C. (Nechako). (2,5)	Complete surficial geology maps and syntheses on ice flow dynamics in the Laurentian region and northern Quebec. (2) Release final maps and reports from Foothills, Nechako, Shield Margin and Winnipeg NATMAP projects. (5)	Provinces, the federal government, the mineral exploration industry and universities. (2,5)	Geoscience mapping is done more efficiently and effectively due to increased integration and application of new technologies and standards. (2,5)
Complete reports and surficial geology maps from Nunavut (Bathurst Island, Contwoyto Lake, Meta Incognita Peninsula, and central Baffin Island). (5)	Complete reports and surficial geology maps from Nunavut (Meta Incognita Peninsula, central Baffin Island, western Victoria Island, Hepburn Island, and Rideout Island). (5)	The Canada–Nunavut Geoscience Office (C-NGO), the Government of Nunavut, northern communities, the mineral exploration industry and climate change impact modellers. (5)	
Publish studies (paper, Open File) of the Carboniferous paleoclimatology of Maritime Canada. (6)	Publish final results of studies on the Carboni-ferous paleoclimatology of Maritime Canada. (6)	Partners St. Francis Xavier University, the Nova Scotia Department of Mines and three exploration companies. (6)	A new understanding is gained of depositional and environmental conditions that controlled the region's sediment-hosted mineral deposits. (6)
Publish final maps and reports on the geology and tectonic history of areas along the Grenville Front. (6)	Produce a 1:2 000 000 tectonic map of Grenville province. (6)	Partners OGS, and Memorial and Dalhousie universities. (6)	A tectonic context for Grenville Province is made available to provincial agencies and universities so that they can evaluate economic potential and environmental concerns. (6)
Publish results of uranium-lead zircon age and samarium-neodynium isotope studies to reconstruct the geological and metallogenic provinces of Laurentian Proterozoic Basin. (6)	Publish studies of the crustal growth and accretion processes of the Canadian landmass, namely the geochronology of central Baffin Island and the strontium and lead environmental tracer studies. (6)	Partners Provincial and territorial agencies, OGDs, municipalities in Quebec, universities and a Russian research institute. (6)	Metallogenic provinces between continents are correlated to expand targets for related mineral deposits. (6) Information on the sources of contamination in lake sediments and groundwater is generated. (6)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.4: Partnered Thematic Mapping (continued)

		Performance Measures	
NATMAP projects are delivered on time and within budget. (2,5) Completion of fieldwork and research on schedule. (6) Release of maps and reports on schedule. (6)	Successful delivery of slope data products to industry and regulatory clients. (1) Signing of new agreements with GEUS and Nunavut. (1) Number of maps on Open File. (2,5)	Amount of academic collaboration. (1,2,5) Number of requests for repeat business from collaborators. (1,2,5) Number of formal provincial collaborations. (2,5)	Number of digital data sets donated to ESS by the oil and gas industry. (1) Reports of private sector use of GSC information to increase levels of mineral and hydrocarbon research. (2,5) Number of gaps identified in the geoscience map coverage. (5,6) Citations of GSC knowledge in scientific literature, industry reports and land use documents, including reports and testimonials from clients. (5,6)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.5: Coordinated Studies of Resource Potential

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Release maps, reports and Open Files from studies, including NATMAP projects, in the St. Lawrence basin of eastern Canada. (1,2,3,6)	Release maps, reports and Open Files from St. Lawrence reservoir compilations (1,2,3,6), as well as gravity and magnetic maps and tectonic interpretation updates. (1)	Provinces, territories, industry, academia, OGDs and the Canadian Geoscience Council. (1,2,3,6)	Geoscience mapping is done more efficiently and effectively due to increased integration and application of new technologies and standards. (1,2,3,6)
Release maps, reports and Open Files from current bedrock geoscience studies, including NATMAP projects, in the Grenville, Superior, Western Churchill and Slave provinces of the Canadian Shield and the Appalachians (2,6); the Western Canada Sedimentary Basin (WCSB) (3); the Cordillera of western Canada (3,4); and the Arctic islands and northern mainland sedimentary basins. (3,6)	Ongoing. (2,3,4,6)	Provinces, territories, industry, academia, OGDs and the Canadian Geoscience Council. (2,3,4,6)	Geoscience mapping is done more efficiently and effectively due to increased integration and application of new technologies and standards. (2,3,4,6)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.5: Coordinated Studies of Resource Potential (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Release maps, reports and modelling studies from investigations of the sub-surface structure and its physical rock properties, including Lithoprobe partnership projects, in parts of the Canadian Shield (Western Superior, Western Churchill, Alberta Basement, Trans-Hudson Orogen, Sudbury) and the Cordillera (Slave-Northern Cordillera Lithosphere Evolution [SNORCLE]). (3,4,6)	Ongoing. (3,4,6)	Provinces, territories, industry, academia, OGDs and the Canadian Geoscience Council. (3,4,6)	Mineral or hydrocarbon exploration by the private sector in target areas increases, ultimately leading to more discoveries. (3,4,6) Identified gaps in the geoscience map coverage of Canada are filled to ensure Canada's competitiveness for global exploration investment. (3,4,6)
Complete geoscience studies of targeted areas of B.C. (Iskut River, Bowser Basin, Nass, Teslin Lake, Queen Charlotte Islands, Pemberton) and the Yukon (Sheldon Lake). (4)	Conduct mapping and metallogenic studies and publish the final results of the geoscience studies of targeted areas in B.C. and the Yukon, including data from the Cordillera Link (CORDLink) digital geoscience library. (4)	The B.C. and Yukon governments, OGDs, academia and exploration industries. (4)	A modern geoscience base for mineral exploration and land use decisions is provided. (4)
Complete the bedrock component of the Nechako NATMAP project and release an A-series map, two *GSC Bulletins*, a CD-ROM on the GIS integrated geology of the central Canadian Cordillera and journal papers. (4)		N.W.T., Indian and Northern Provincial and territorial governments, academia and the mineral exploration industry. (4)	Understanding of the stratigraphy, structure, geochronology and tectonics of an important block of the Canadian Shield improves significantly, and helps in land-use planning, the assessment of mineral potential, and exploration for such commodities as diamonds, base metals and gold. (4,6)
Complete fieldwork and release a paper in *Current Research* and map products for the Slave Province. (5)	Release the digital Geoscientific Atlas of the Slave province.(6)	Affairs Canada (INAC), the exploration industry (diamonds, base metals, gold), Lithoprobe and six universities. (6)	Exploration increases. (4, 6)
Conduct and participate in northern development workshops, the Nunavut Geoscience Symposium, the Yellowknife and Yukon Geoscience forums and community consultations. (4,6,7,21)	Ongoing. (4,6,7,21)	Partners and beneficiaries The governments of the Yukon, N.W.T., Nunavut and northern communities, as well as mining and mineral exploration companies. (4,6,7,21)	Clients and potential benefactors are more aware of annual federal geoscience activities and scientific results in northern regions. (4,6,7,21) Northern communities make informed decisions on exploration and sustainable development of economic discoveries. (4,6,7,21) Community capacity in earth sciences increases. (4,6,7,21)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.5: Coordinated Studies of Resource Potential (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Publish A-series bedrock geology maps, journal papers, articles in *Current Research*, CD-ROMs, and MSc and PhD theses from the Western Churchill NATMAP project. (6,7)	Complete the Western Churchill NATMAP project by publishing the final comprehensive bedrock *GSC Bulletins*, a GIS compilation, journal papers and theses. (6,7)	Partners INAC, the Nunavut Department of Sustainable Development, C-NGO and three universities. (6,7) Beneficiaries Mineral exploration companies. (6,7)	GSC knowledge is used to target exploration for gold, base metals, uranium and diamonds. (6,7)
Publish journal papers and maps on the geology and tectonic history of the Appalachian Province. (6)		Partners The geological surveys of New Brunswick, Nova Scotia, and Newfoundland and Labrador, and universities. (6)	Understanding of the geological evolution of the Orogen increases. (6) Exploration companies are better able to target their exploration programs in the Bathurst region. (6)
Conduct aeromagnetic/ multiparameter geophysical surveys in Mackenzie III, central Baffin, northern Saskatchewan and the Yukon. (6,7)	Ongoing in Mackenzie IV, Committee Bay and north Baffin Island. (6)	Partners and beneficiaries Oil and gas companies, mineral exploration companies, the Government of Nunavut, N.W.T., INAC and the National Energy Board. (6)	Information for mediation among industry and interest groups is provided.(6) Hydrocarbon and mineral exploration is enhanced in frontier areas. (6)
Release new magnetic and gravity maps, databases and interpretations of the regions of Restigouche, Mackenzie Corridor I and Saskatchewan. (6)	Ongoing in the regions of Mackenzie, Lake Ontario and surrounding areas, and Ontario. (6)	Partners and beneficiaries The Saskatchewan Department of Mines and Energy, OGS, the Government of New Brunswick, N.W.T., Ontario Power Generation and exploration companies. (6)	Knowledge of crustal structure in highly populated areas of Canada and the U.S. near Lake Ontario improves. (6) Hydrocarbon and mineral exploration is enhanced in frontier areas. (6)
Under the auspices of Canada's Lithoprobe Program, complete Western Superior and SNORCLE Transects field studies, and publish journal papers on seismic reflection, refraction and electro-magnetic studies. (6)	Complete Canada's Lithoprobe Program. (6) Publish journal papers and the Pan-Canadian Lithoprobe synthesis (6)	Partners Universities (Queen's, McGill, Toronto, Manitoba, Calgary, UBC), European universities (Leeds, Milano), the Woods Hole Oceanographic Institute, OGS, INAC, N.W.T. and exploration industries. (6)	Crustal structure data are used to plan and safely operate public utilities. (6) The identification of exploration targets is promoted. (6) The Lithoprobe final report cites the importance of GSC research. (6) Increased geoscientific knowledge is made available to help parties make sound economic, environmental and social decisions. (6)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.5: Coordinated Studies of Resource Potential (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Acquire precise thermochronological and geochronological data from argon-argon dating techniques in support of the Ancient Pacific Margin NATMAP project, and publish journal papers and digital databases. (6)	Investigate the utility of argon-argon and uranium-lead dating techniques for environmental and hydrogeological studies, neo-tectonics, and the Red Indian Line project. (6)	Partners Universities (UBC, Alberta), provincial and territorial surveys (Yukon, B.C., Nunavut), and exploration companies. (6)	New information on mid- to low-temperature processes associated with mineral deposit emplacement is acquired. (6) Argon-argon dating methodologies are routinely used in environmental and hydrogeological studies, including studies of volcanic hazards. (6)
↑	↑	**Performance Measures** ↑	↑
Delivery of NATMAP projects on time and within budget. (2,6) Number of northern development workshops held. (4,6,7,21) Completion of aeromagnetic data acquisition on schedule and to defined standards. (6,7) Completion of the Lithoprobe program on schedule. (6)	Number of maps on Open File. (2,6)	Number of requests for repeat business from collaborators. (1-4,6) Amount of academic collaboration. (1-4,6) Number of formal provincial collaborations. (1-4,6) Attendance at northern development workshops. (4,6,7,21) Product sales. (1-4,6) Number of requests for products. (1-4,6) Number of web site hits. (1-4,6) Participation level and contributions made by collaborators. (1-4,6) Renewed or expanded participation by collaborators in new or related ventures. (1-4,6)	Information about private sector use of GSC reports to increase levels of mineral and hydrocarbon exploration. (1-4,6) Sales of Open Files. (1-4,6) Number of gaps identified in the geoscience map coverage. (1-4,6) Citations of GSC knowledge in scientific literature, industry reports and land use documents, including reports and testimonials from clients. (1-4,6,7) Level and range of mineral exploration in regions of newly released GSC geoscience knowledge, including Western Slave Province, Nechako region and Western Churchill. (4,6) Information about the use of geoscience knowledge in northern community land use decisions, including Mineral Review and Evaluation Assessment (MERA) decisions on national parks and marine protected areas. (6) Number of invitations to participate and to present keynote talks. (6) Funding acquired for Lithoprobe data archive. (6)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.6: Increasing Geoscience Capacity

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Operate analytical laboratories (such as analytical chemistry, x-ray, stable isotopes, geochronology, Sensitive High-resolution Ion Microprobe [SHRIMP]), and develop new analytical techniques and applications. (6,7)	Ongoing. (6,7) Increase the amount of data being delivered via the intranet. (6,7)	GSC, OGDs, provincial and territorial surveys, universities, the mining industry, and mineral and hydrocarbon exploration industries. (6,7)	Analytical data that are critical for environmental, mineral exploration and hydrogeology geoscience studies are provided. (6,7) Analytical capabilities, measurement accuracy, sampling requirements and non-destructive techniques are improved. (6,7)
Develop new methodologies for managing, integrating and analyzing geoscience data from bedrock geoscience projects. (6) Develop 2-D and 3-D analysis and visualization capability. (6) Release CD-ROMs, databases and journal publications. (6)	Ongoing. Test, apply and transfer technology for 2-D and 3-D visualization. (6)	The mineral exploration industry, provincial and territorial surveys, universities and the Lithoprobe project. (6)	New and improved data management, integration and distribution methods for digital geoscience data are available to support the resource exploration community, and provincial and territorial agencies. (6)
Provide on-demand aeromagnetic and gravity data and interpretations from the Geophysical Data Centre. (6)	Develop a digital archive of industry magnetic survey data to replace data currently available from provincial agencies in analog format only. (6)	Clients Exploration companies, mining companies, geophysical consultants and the GSC. (6)	The Canadian Geoscience Publication Directory is developed. (6) Access to standardized potential field data and products, customized to clients' requirements, improves. (6)
Assess relative and absolute level of aeromagnetic data along the Canada-U.S. border. (6)	Complete the Magnetic Anomaly Database of North America (MADONA) grid and make it available on the Internet. (6)	Partners USGS, the Mexican Geological Survey and universities. (6)	A consistent aeromagnetic database and key contributions to tectonic framework studies of North America are provided. (6)
Provide regional and localized geochemical databases for central Baffin Island, Restigouche, the Yukon, Grenville supergroup (mercury), the National Geochemical Reconnaissance (NGR) and the online library of Exploration Science and Technology Program (EXTECH) II (Bathurst) geochemical data. (7)	Provide regional and localized geochemical databases and the NGR. (7)		Mineral exploration is better targeted through the use of geochemical data. (7) New ore deposits are discovered. (7)

Objective 1.3: Geoscience Knowledge

Strategy 1.3.6: Increasing Geoscience Capacity (continued)

		Performance Measures	
Performance of laboratories to defined standards for results and efficiency. (6) Successful development of new methodologies for managing, integrating, visualizing and analyzing geoscience data. (6,7)	Amount of data available on the ESS intranet. (6)	Size of client base. (6) Sales and distribution of new software. (6) Number of web site hits. (6)	Revenue generated from products and services. (6) Use of the Canadian Geoscience Publications Directory by the Canadian geoscience community. (6) Routine use of GSC analytical tools and methods by industry, universities and service agencies. (6,7)

Objective 1.4: Cadastral Survey Framework: Provide a georeferenced digital cadastral framework for integration and dissemination of land-related information.

Objective 1.4: Cadastral Survey Framework

Strategy 1.4.1: Population of Georeferenced Databases

Strategy 1.4.2: Dissemination of Land-related Information

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Populate strategic digital cadastral databases. (9)	Ongoing. (9)	Aboriginal communities, Canada Land Survey System users and other groups. (9)	Georeferenced data are available for strategic databases. (9)
Establish an integrated information dissemination and marketing infrastructure. (9,22)	Ongoing. (9)		An integrated information, dissemination and marketing infrastructure is created. (9)
Enhance corporate web sites. (9,22)		Aboriginal communities, INAC and Parks Canada. (9)	Aboriginal groups use their cadastral data for economic, environmental and social decision-making. (9) Clients are satisfied with Legal Services Division (LSD) services. (9)

		Performance Measures	
Percentage of databases populated. (9)			Completion of population of strategic digital cadastral databases by 2005. (9) Proportion of clients rating LSD services as "excellent". (9)

Objective 1.5: Resource Assessments: Conduct and communicate the results of resource assessments, as required by federal policy.

Objective 1.5: Resource Assessments

Strategy 1.5.1: Proposed National Parks

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Conduct mineral and energy resource assessments of proposed protected natural regions identified by the Senior Mineral and Energy Resource Assessment Committee (SMERAC). (3,7)	Ongoing. (3,7)	Parks Canada, SMERAC Nunavut, N.W.T., provinces, federal policy makers, the International Joint Commission, INAC, OGDs and land-use planners. (3,7)	Decisions to establish new national parks are taken with an understanding of the trade-offs. (3,7) Decisions regarding the establishment of new national parks (northern Bathurst Island, Ukkusiksalik) are undertaken with an understanding of the regions' mineral and energy resource potential. (7) A balance is maintained between protected natural areas and regions open for resource exploration for sustained economic and social requirements. (7)
↑	↑ Performance Measures ↑		↑
Number of requests for onshore mineral resource assessments. (3,7)		Acceptance of resource assessments by SMERAC. (3,7) New requests for resource assessments. (7)	Recognition of GSC work by Parks Canada. (3,7) Evidence attesting to the use of resource assessment information in decision-making about national parks. (3,7)

Objective 1.5: Resource Assessments

Strategy 1.5.2: Marine Protected Areas

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Conduct offshore resource assessments for marine conservation areas as requested. (1)	Ongoing. (1)	Parks Canada. (1)	Decisions to establish new marine protected areas are taken with an understanding of the trade-offs. (1)
↑	↑ Performance Measures ↑		↑
Number of requests for offshore mineral resource assessments. (1)			Recognition of work by Parks Canada. (1) Evidence attesting to the use of mineral resources assessments in decision-making about marine protected areas. (1)

Objective 1.5: **Resource Assessments**

Strategy 1.5.3: Hydrogeological Resources

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop and implement the GSC Hydrogeology program. (2,3,5)	Conduct the GSC Hydrogeology program. (2,3,5)	Provinces, territories, the federal government, EC, municipalities, land-use planners and environmental groups. (2,3,5)	Decisions with respect to removal of groundwater are guided by an understanding of resource adequacy. (2,3,5)
Collect groundwater hydrogeochemical field data in B.C., Manitoba, New Brunswick and Nova Scotia. (7)	Produce a national database on groundwater chemistry. (7)	Mineral exploration companies. (7)	Clients and stakeholders have rapid access to national groundwater chemistry data. (7)
	Develop new groundwater exploration methods for concealed mineral and hydrocarbon deposits. (7)	Local municipalities. (7)	Information for more effective exploration and environmental decision-making is provided. (7)
			New sources of potable water are identified. (7)
↑	↑ **Performance Measures** ↑		↑
Completion of fieldwork and research on schedule. (7)		Participation level and contributions from collaborators. (7)	Information about the incorporation of GSC groundwater data in land-use decision-making. (7)
Successful development of groundwater exploration methods. (7)		Sales of products. (7)	
		Requests for products from client base. (7)	

Objective 1.6: **Knowledge Access and Management: Develop methodologies and infrastructure that will improve the quality, delivery, integration, accessibility and use of geospatial and geoscience information and expertise.**

Objective 1.6: **Knowledge Access and Management**

Strategy 1.6.1: Management of ESS Information Resources

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Release regional and targeted digital geoscience databases for priority areas of the Canadian Shield, Appalachian and WCSB/ Cordillera regions, and northern Canada. (2,3,4,6,22)	Ongoing. (2,3,4,6,22)	Provinces, territories, industry and federal policy makers. (2,3,4,6)	A broad clientele recognizes the importance of earth science information. (2,3,4,6)
Implement and test national standards for digital geoscience data and conform to the North American Data Model. (2,4,5,6,15,22)	Pursue collaborations with Canadian and international partners and clients. (2,4,5,6,15,22)	Provinces, territories, industry, academia and the international earth science community. (2,4,5,6,15)	GSC-developed standards are recognized nationally and internationally. (2,4,5,6,15)
	Continue to develop standards and to work with provincial surveys. (15)		

Objective 1.6: Knowledge Access and Management

Strategy 1.6.1: Management of ESS Information Resources (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Provide and manage a comprehensive, reliable, network-based infrastructure and services for delivering geoscience information. (15)	Ongoing. (15)	Internal and external users. (15)	Access to digital geoscience data is improved. (15)
Complete development of the Geoscience Data Warehouse to manage and distribute geological map data and other geoscience digital data within ESS. (15)	Expand the contents and functionality of the Geoscience Data Warehouse. (15) Extend access to front-end applications. (15)	Internal and external users from all domains, GeoInnovations, ResSources GSC, GSC divisions, other NRCan Sectors and industry. (15)	Access to digital geoscience data by ESS and by all Canadians is improved. (15)
Manage the design and production of geological maps, illustrations, figures and photographs using state-of-the-art cartographic methods. (15)	Ongoing. (15)	All GSC divisions. (15)	Client requirements for quality geological maps, illustrations, figures and photographs are met or exceeded. (15) Sales of publications increase. (15)
Provide access to 33 electronic journals. (15)	Continue developing licensing agreements for electronic journals. (15)	ESS staff and Elsevier Press. (15)	More journals are available electronically. (15)
Help develop data standards to facilitate the creation of customized products. (15)	Implement data standards. (15)	ESS staff and the public sector. (15)	Metadata standards and metadata are more broadly accepted across NRCan. (15) New customized products are created. (15)
Improve access to, and usability of, ESS products, data and services by digitizing information holdings. (15,22)	Implement data standards to facilitate the creation of customized products and identify the need for additional tools. (15,22)	ESS staff and the public sector. (15)	The usefulness of ESS information increases, and processes for maintaining the ESS information base and for managing data are improved. (15)
Contribute to ResSources GSC projects, such as the Data Warehouse project and Terminology Database project. (15,22)	Ongoing. (15)	ESS staff and specialized clientele. (15)	Database access increases. (15)
Develop and improve the geological map database standards and mapping techniques. (15,22)	Ongoing. Adapt to technological changes and develop new cartographic techniques. (15,22)	USGS, provincial geological surveys and private contractors, ESS clients and other mapping agencies. (15)	Users accept specifications and standards. (15)
Enhance Internet and intranet access to the ESIC virtual library, cartographic services, scientific publishing, GSC bookstore web sites and the Geoscience Data Warehouse. (15,22)	Continue developing web sites and enhancing Internet and intranet services. (15,22)	ESS staff, internal and external ESS clients, and the public sector. (15)	Client access to ESS products and services increases. (15) New and improved search engines are developed and put in use. (15)

Objective 1.6: Knowledge Access and Management

Strategy 1.6.1: Management of ESS Information Resources (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Help the four natural resources-related departments plus Health Canada (the 5NR) work together, share data, and communicate science and technology to the public. (15,22)	Ongoing and growing. (15,22)	NRCan, AAFC, EC, DFO, Health Canada and the public sector. (15)	Information activities of the 5NR departments increase. (15)
Establish a planning, accountability and technical framework for ResSources. (15,22)	Identify ResSources as a key element in future business plans and identify ResSources activities in accountability accords. (15,22)	ESS staff, NRCan Sectors, specialized clientele in industry and academia, Canadian citizens, and students in Kindergarten through Grade 12. (15)	ESS makes a sector-wide commitment to ResSources activities. (15) Deliverables for ResSources are identified for all senior managers in the accountability accord. (15)
Strengthen and influence the direction of the NRCan, ESS and ResSources GSC initiatives by consulting with clients and analyzing the competition. (15,20,22)	Ongoing and increasing as resources become available. (15,20,22)	NRCan, ESS and the GSC. (15,20)	Recommendations are made to the ResSources Steering Committee and management about ESS data and identified gaps. (15,20)
Effectively support secure electronic commerce for the sale of ESS products from the GSC bookstore. (15,22)	Continue improving electronic commerce functionality and services. (15,22) Identify opportunities to extend electronic commerce applications. (15,22)	ESS staff and the public sector. (15)	Secure electronic commerce for ESS products is established. (15)
Develop a proposal to digitize photos and submit it to the Canada's Digital Collections Initiative at Industry Canada (IC). (15,22)	Continue digitizing the ESS photo collection as part of the Virtual Library. (15,22)	IC, internal and external ESS clients, and the public sector. (15)	The number and variety of GSC photo images available in digital format increase. (15)

↑	↑ Performance Measures ↑		↑
Approval of national standards for digital geoscience data (Geoenvironmental Information Management System, or GIMS). (2,4,5,6,15) Meeting of production targets. (15) Number of web sites being upgraded for improved access. (15) Successful implementation of the Virtual Library. (15)	Number of licence agreements signed for electronic journals. (15)	Extent of collaboration. (2,4,5,6,15) Attendance at the 5NR workshop. (15) Number of ESS staff contributing to ResSources initiatives. (15)	Feedback received on national standards. (2,4,5,6,15) Sales of publications. (15) Client feedback on specifications and standards. (15) Value of sales conducted via the Internet. (15) Number of full-text electronic journal titles available on the ESS intranet. (15) Client feedback. (15)

Objective 1.6: Knowledge Access and Management

Strategy 1.6.1: Management of ESS Information Resources (continued)

	Performance Measures	
Holding of a 5NR workshop to discuss tools for cooperation among partners. (15) Funding received to digitize photos. (15)		Client feedback. (15) Meeting of revenue targets (approximately $200 000). (15) Feedback and evaluation. (15) Establishment of a planning and accountability framework for ResSources. (15) Identification of ResSources activities in the current business plan. (15)

Objective 1.6: Knowledge Access and Management

Strategy 1.6.2: Access to ESS Information

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Complete Geoscape posters for the urban centres of Quebec, Montreal, Calgary, Victoria and southern Saskatchewan. (1-7,22)	Ongoing for Toronto, Ottawa, Winnipeg, Halifax, Nunavut and the Yukon. (1-7,22)	Provinces, territories, academia, the public sector, communities and educators. (1-7)	Canadians are better equipped to make decisions on a range of important issues. (1-7)
Facilitate outreach by visiting classrooms, participating in conferences and disseminating information on web sites. (1-7)	Ongoing. (1-7)	Secondary school students and teachers, and the Canadian public sector. (1-7)	Accessibility and utility of geoscience information for informed decision-making are enhanced. (1-7)
Build on the existing CORDLink prototype to develop the western regional node for the Canadian Geoscience Knowledge Network (CGKN). (4,22)	Ongoing. Implement spatial searches, facilitate construction of "branch holdings" and link with cross-disciplinary libraries. (4,22)	Beneficiaries The geoscience community and the public sector. (4) Clients Policy makers, the Yukon Geoscience Office and EC. (4) Partners BCGS, other GSC divisions, UBC and USGS. (4)	The client base for geoscience information is expanded. (4) Geoscience holdings for western Canada are fully linked and easily accessible. (4) Geoscience information is integrated into land-use decisions. (4) The geoscience community's capacity in digital library development and information management is expanded. (4)
Build and populate a GIS viewer (5,22)	Increase use of the Internet for publication and outreach. (5,22)	Public sector, educators, the private sector, OGDs and other divisions. (5)	Canadians are better able to view data and obtain information from the Internet for decision-making on a range of important issues. (5)

Objective 1.6: Knowledge Access and Management

Strategy 1.6.2: Access to ESS Information (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop the capability to provide access to Landsat-7 data. (10)	Develop capabilities to provide access to Envisat Synthetic Aperture Radar (SAR) data and RADARSAT-2 data. (10)	Canadian industry and OGDs. (10)	Operational use of satellite data increases. (10) Data sales increase. (10)
Continue developing Canadian Earth Observation Network (CEONet) technology and connections to external metadata repositories. (10,22)	Continue development by making greater use of the National Atlas database and thematic layers in the search engine. (10,22)	Canadian industry. (10)	User access to data improves. (10)
Continue to explore improved data delivery methods for GeoGratis. (10,22)		Academia looking for geospatial information related to key features in Canada's physical, environmental, social and economic geography. (10)	Transparent access is provided to data from distributed systems. (10)
Adopt protocols and build partnerships with federal agencies, industry associations, special interest groups and others who can contribute national scale information to the National Atlas of Canada. (10,22)	Continue to develop data access and partnerships with data custodians. (10,22)	Industry (Open GIS Consortium), OGDs, academia and community groups. (10)	The National Atlas of Canada provides more layers of thematic maps of interest to communities. (10)

Performance Measures

Number of Geoscape posters completed and distributed. (1-7) Establishment of the western regional node for the CGKN. (4) Completion of development of Landsat-7 data capability. (10)	Ability to provide access to Envisat SAR signal data by 2001/2002. (10) Ability to provide access to RADARSAT-2 signal data by 2002/2003. (10)	Statistics on international external use of the Canadian Marine Geoscience Information Network and GSC educational web sites. (1-7) Scope of outreach requested by clients. (1-7) Level of participation in outreach activities. (1-7) Documented use of CORDLink. (4) Number of partnerships. (10)	Feedback from the public sector about the accessibility and utility of geoscience information. (1-7) Number of invitations to make presentations received by the GSC. (1-7) Testimonials from clients. (4) Number of hits on the Terrain Sciences Division web site (target is 1.5 million in Year 1 and 2 million in Years 2 and 3). (5) Data sales. (10) Number of new thematic maps made available. (10)

Objective 1.6: **Knowledge Access and Management**

Strategy 1.6.3: Policies and Standards for Data Integration

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Implement federal-provincial-territorial coordination agreements. (1-7)	Implement remaining agreements and update existing ones. (1-7,15)	Provinces, territories and the public sector. (1-7)	Relations with the provinces improve. (1-7) Delivery of federal, provincial and territorial programs improve. (1-7)
Integrate and distribute digital data from GEOIDE projects and GSC hydrogeology projects. (2)	Pursue integration of digital information (2)	Provinces, territories, industry, academia and municipalities. (2)	Clients and stakeholders have rapid access to a broad spectrum of readily integrated earth science information. (2)
↑	↑ **Performance Measures** ↑		↑
Provision of online access to HYDROLINK. (2)		Number of coordination agreements in place. (1-7)	Number of visits and requests for information received. (1-7)

ESS Goal 2: Provide geospatial and geoscientific knowledge to help develop and sustain economic and social benefits.

Objective 2.1: **Resource Exploration: Promote discovery of the resources required to sustain mineral and hydrocarbon production in Canada, through thematic research conducted in collaboration with provinces, territories, industry and academia.**

Earth Sciences Sector Total Funding by Objective ($ 000)

ESS GOAL 2		2000/2001	2001/2002	2002/2003
2.1	Resource Exploration	10 127	9 589	9 590
2.2	Industry Support	15 633	15 512	15 509
2.3	Rural, Remote and Aboriginal Communities	15 243	14 261	13 803
2.4	Northern Research	6 441	5 988	6 267

Objective 2.1: **Resource Exploration**

Strategy 2.1.1: Mineral and Hydrocarbon Research

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Complete a basin analysis of the Gulf of St. Lawrence in support of renewed oil and gas exploration activity in the region. (1,2,3)	Release maps and reports on basin analysis of the Gulf of St. Lawrence. (1,2,3)	The exploration industry, the international investment community and federal policy-makers. (1,2,3)	Areas with potential for deposit types, not previously known in Canada, are recognized and attract new exploration investment. (1,2,3)
Initiate framework and origin studies of the chromite deposits in southern Quebec. (2)	Complete final reports on chromite deposits. (2)	Provinces and the exploration industry. (2)	Breakthroughs in the understanding of the origin and distribution of mineral and hydrocarbon resources are made. (2)
Define and refine deposit models for representative Canadian deposit types. (2,7) Finalize a collaboration with Newfoundland on gold metallogeny. (2)	Ongoing. (2, 7)	Provinces, territories, the exploration industry, OGDs and the investment community. (2,7)	Deposit models are improved. (2,7) The level and effectiveness of resource exploration is increased. (2,7)
Complete and release a petroleum assessment of the Intermontane Cordilleran basins. (3)	Cooperate with N.W.T. and the Yukon on oil and gas assessments of the Yukon and N.W.T. (3)	The exploration industry, OGDs, the Aboriginal community, N.W.T., the Yukon and the investment community. (3)	Better policy decisions and more efficient exploration attract new investment. (3)
Acquire physical property data (porosity, permeability, conductivity, rock texture) from worldwide drill-hole localities. (7)	Develop dynamic pore structure models for sedimentary rocks. (7)	The U.S. and U.K. oil drilling industry. (7)	An understanding of over pressures to be encountered in drilling for oil and gas is developed. (7)
Conduct research on the origins and emplacement of mineral deposits: volcanogenic massive sulphides (VMS)-porphyry, VMS-epithermal, Sudbury Cu-Ni-PGE and modern seafloor hydrothermal systems. (7)	Ongoing. (7)	Mineral and exploration industries, mining industries, mining associations, the Canadian Mining Industry Research Organization and the B.C. Geological Survey. (7)	Safety and efficiency in drilling for hydrocarbons is improved. (7) Reserves in new and "known" areas are extended. (7)

ESS Goal 2: Provide geospatial and geoscientific knowledge to help develop and sustain economic and social benefits.

Objective 2.1: **Resource Exploration: Promote discovery of the resources required to sustain mineral and hydrocarbon production in Canada, through thematic research conducted in collaboration with provinces, territories, industry and academia.**

Objective 2.1: **Resource Exploration**

Strategy 2.1.1: Mineral and Hydrocarbon Research

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Complete a basin analysis of the Gulf of St. Lawrence in support of renewed oil and gas exploration activity in the region. (1,2,3)	Release maps and reports on basin analysis of the Gulf of St. Lawrence. (1,2,3)	The exploration industry, the international investment community and federal policy-makers. (1,2,3)	Areas with potential for deposit types, not previously known in Canada, are recognized and attract new exploration investment. (1,2,3)
Initiate framework and origin studies of the chromite deposits in southern Quebec. (2)	Complete final reports on chromite deposits. (2)	Provinces and the exploration industry. (2)	Breakthroughs in the understanding of the origin and distribution of mineral and hydrocarbon resources are made. (2)
Define and refine deposit models for representative Canadian deposit types. (2,7)	Ongoing. (2, 7)	Provinces, territories, the exploration industry, OGDs and the investment community. (2,7)	Deposit models are improved. (2,7)
Finalize a collaboration with Newfoundland on gold metallogeny. (2)			The level and effectiveness of resource exploration is increased. (2,7)
Complete and release a petroleum assessment of the Intermontane Cordilleran basins. (3)	Cooperate with N.W.T. and the Yukon on oil and gas assessments of the Yukon and N.W.T. (3)	The exploration industry, OGDs, the Aboriginal community, N.W.T., the Yukon and the investment community. (3)	Better policy decisions and more efficient exploration attract new investment. (3)
Acquire physical property data (porosity, permeability, conductivity, rock texture) from worldwide drill-hole localities. (7)	Develop dynamic pore structure models for sedimentary rocks. (7)	The U.S. and U.K. oil drilling industry. (7)	An understanding of over pressures to be encountered in drilling for oil and gas is developed. (7)
Conduct research on the origins and emplacement of mineral deposits: volcanogenic massive sulphides (VMS)-porphyry, VMS-epithermal, Sudbury Cu-Ni-PGE and modern seafloor hydrothermal systems. (7)	Ongoing. (7)	Mineral and exploration industries, mining industries, mining associations, the Canadian Mining Industry Research Organization and the B.C. Geological Survey. (7)	Safety and efficiency in drilling for hydrocarbons is improved. (7) Reserves in new and "known" areas are extended. (7)

Objective 2.1: Resource Exploration

Strategy 2.1.1: Mineral and Hydrocarbon Research (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Publish the Sullivan Mine (B.C.) studies. (7)	Publish hydrothermal studies and VMS deposits information (Kidd Creek, Iberian deposits). (7)		New economic discoveries are made in northern communities. (7)
Determine the metallogeny of mineral deposit types by completing the Western Churchill National Geoscience Mapping Program (NATMAP) study. (7)	Conduct research on VMS and Sedimentary Exhalative (SEDEX) deposits of terranes in B.C. and the Yukon (Ancient Pacific Margin NATMAP). (7)	The exploration industry, the mining industry, provincial surveys (B.C., Yukon), Canadian universities and one U.S. university. (7)	New models of ore genesis and emplacement are developed. (7) The efficiency and effectiveness of exploration is improved. (7) New exploration strategies are developed. (7) Mineral resources in northern regions are developed. (7)
↑	↑ **Performance Measures** ↑		↑
Completion of the Gulf of St. Lawrence Basin Analysis. (1,2,3) Release of the Intermontane Cordilleran Basins petroleum assessments. (3) Reports of GSC physical property data being used in the development of models. (7) Completion of research as planned. (7) Release of publications on schedule. (7)	Release of reports on Yukon and N.W.T. oil and gas assessments. (3)	Number of oil and gas industries requesting information. (1,2,3) Contributions of samples and data from oil drilling companies. (7) Sales of publications. (7) Number of requests for publications and data. (7)	References to increased exploration in the Gulf of St. Lawrence due to information acquired from the Geodetic Survey Division (GSD). (1,2,3) Reports of GSC dynamic pore structure models being used in drilling procedures. (7) Discovery of new mineral deposits in established mining camps and frontier areas. (7)

Objective 2.1: Resource Exploration

Strategy 2.1.2: Knowledge of Non-renewable Resources

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Conduct multi-disciplinary research around Vancouver Island to assess the distribution, formation and dissociation processes of marine gas hydrates offshore. (4)	Ongoing. (4)	NRCan's Energy Sector, the National Energy Board, Indian and Northern Affairs Canada (INAC), Environment Canada (EC), oil and gas companies, the Geological Survey of Japan and the Ocean Drilling Program. (4)	Baseline information for use in establishing Canada's energy policy for unconventional sources is generated. (4)
Lead a mapping program for offshore gas hydrates and install seabed instrumentation. (5,7)	Complete high-resolution marine and terrestrial geophysical surveys to delineate and quantify gas hydrate occurrences. (4,5) Conduct field drilling and production testing of an Arctic gas hydrate production well. (4,5)	The National Research Council (NRC), NRCan, INAC, N.W.T., the Japan National Oil Company, the U.S. Geological Survey (USGS), the exploration industry, academia, Canadian-Burlington Resources, Imperial Oil, Shell Canada and JAPEX Canada Ltd. (4,5,7)	An improved understanding of the occurrence, distribution and geohazard aspects of gas hydrates is developed. (4,5,7) The competitiveness of Canadian industry in unconventional energy is enhanced. (4,5,7)
Initiate studies of Lac de Gras diamonds and diamond indicators. (5,7)	Complete studies. (5)	The mineral exploration industry, provinces and territories. (5,7)	
↑	↑ **Performance Measures** ↑		↑
Completion of research and publication of results on schedule. (4) Installation of seabed instrumentation. (5,7) Completion of projects on schedule (5,7)		Extent of collaboration. (4) Number of partnerships established in gas hydrates research. (4,5,7)	References to the use of GSC's research in the development of policies on unconventional energy in Canada. (4) Level of private sector funding in gas hydrates research. (4,5,7)

Objective 2.1: Resource Exploration

Strategy 2.1.3: Sustainable Resource Exploration and Development

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Release results on drift prospecting and geochemical exploration methods in northern Quebec and the Abitibi clay belt in Ontario. (2,5,7)	Complete work on drift prospecting and geochemical exploration methods in Quebec. (2,5,7)	The mineral exploration industry, provinces and territories. (2,5,7)	Improved deposit models increase the level and effectiveness of resource exploration. (2,5,7)
For the Exploration Science and Technology Program (EXTECH III), conduct geological, geochemical and geophysical studies, and incorporate the results into a geoscience database of local mine geology and regional settings. (5,7)	Develop new and improved gold exploration models specific to terrain. (5,7) Produce an enhanced Geographic Information System (GIS)-based geoscience knowledge base. (5,7,22)	INAC, N.W.T., seven Canadian universities, two mining companies and mineral exploration companies. (5,7)	More effective exploration takes place in known mineralized areas and exploration targets are identified in newly identified prospective terranes. (5,7) The Yellowknife district mining industry is sustained and diversified. (5,7) Mineral exploration and future geoscience studies in the Yellowknife region are expanded. (5,7)
↑	↑ **Performance Measures** ↑		↑
Number of citations referenced in industry trade journals. (2,5,7) Completion of research as planned. (7) Release of publications on schedule. (7)		Recognition of ESS work by industry review committees. (2,5,7) Funds and in-kind support leveraged through collaboration. (7)	Level of mineral exploration activity. (2,5,7)

Objective 2.2: Industry Support: Enhance the capacity and efficiency of the Canadian geomatics and geoscience industries in order to increase their global competitiveness.

Objective 2.2: Industry Support

Strategy 2.2.1: Business Opportunities

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Continue assisting the national marine survey consulting sector with commercial opportunities for Law of the Sea-related activities, contingent on Canada's decision about the Law of the Sea. (1)	Ongoing, if required. (1)	The marine survey industry. (1)	The technological capacity of Canadian exploration and service companies is enhanced. (1)

Objective 2.2: Industry Support

Strategy 2.2.1: Business Opportunities (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Continue calibrations and refine bottom characterization techniques. (1)	Field test applications and validate bottom characterization techniques with industry and government partners. (1)	The marine survey industry. (1)	Canada's international development assistance objectives are achieved. (1)
Provide advice on unique geoscience equipment to the Canadian marine industry. (1)	Continue to provide advice and unique geoscience equipment to the Canadian marine industry to enhance competitiveness. (1)	The marine industry. (1)	The international competitive position of the Canadian marine industry is enhanced. (1)
Apply Canadian ocean mapping and potential field analysis technology to international near-shore projects, as opportunity permits. (1)	Ongoing. (1)	The marine industry and the petroleum industry. (1)	Industry's demand for unique marine survey equipment increases. (1)
Monitor and calibrate surveys and reports for an offshore dump site test area. (1)	Finalize and release reports on the stability of offshore dump sites. (1)		
Participate in Year 3 of Phase III of the World Minerals Data Base Project, contingent on renewed partnerships and cost-shared agreements. (2,7)	Complete input for the World Gold Geoscience Database by 2003. (7)	The Canadian International Development Agency (CIDA) and the Government of Brazil. (2,7)	Canada's international development assistance objectives are achieved. (2,7)
Complete enhancements of the Marine Electro-magnetic (MEM) system and evaluate the appropriateness of its transfer to the private sector. (4)	Transfer technology to the private sector if appropriate. (4)	Canadian industry, fisheries managers, harbour authorities and aggregate (sand and gravel) companies. (4)	An instrument for seafloor mapping is developed for aggregate exploration, fish habitat studies and harbour dredging. (4) A commercial instrument for use by Canadian marine survey companies is developed. (4)
Complete Year 4 of the five-year Downhole Seismic Imaging (DSI) consortium study by field testing the DSI capacity to detect and model ore deposits in 3-D over different ore-body configurations. (6)	Complete the DSI study and transfer the capability to conduct DSI surveys to industry. (6)	Beneficiaries and partners Canadian, British and German universities, mining and exploration companies. (6)	The technological capacity of Canadian exploration and service companies is enhanced. (6) Canadian industry adopts new geophysical tools and capabilities for mineral exploration. (6) Exploration for base metals and sulphides becomes more efficient and effective. (6)

Objective 2.2: Industry Support

Strategy 2.2.1: Business Opportunities (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop, test and apply new techniques and technologies for mineral exploration: remote sensing (hyperspectral data), borehole geophysics (*in situ* ore grade estimation, groundwater), isotopes (oxygen isotope mapping tool). (7)	Ongoing. (7)	The Canada Centre for Remote Sensing (CCRS), the mineral industry (including exploration and the mining industry), the National Aeronautics and Space Administration (NASA) and a Canadian university. (7)	New and additional methods and tools for use by the Canadian mineral exploration industry are provided. (7) Other GSC and government products become more efficient and effective. (7)
Let contracts for domestic production activities on the road network of the National Topographic Data Base (NTDB) (target is $400 000). (11,22)	Ongoing (target is $500 000 to $600 000). (11)	Canadian private sector contractors. (11)	The capability of the Canadian private sector to conduct dynamic GPS surveys is increased. (11)
Let contracts for work on Vector Map (VMAP1) production. (11,22)	Ongoing. (11)	Canadian private sector contractors. (11)	Canadian private sector companies are capable of competing for VMAP1 production contracts abroad. (11)
Contract out the production of 250 new and revised maps. (11,22)	Expand the level of contracting out to produce 400 new or revised maps. (11,22)	Canadian private sector contractors. (11)	
Produce the ESS *Business Opportunities Bulletin* by March 31. (13)	Ongoing. (13)	Canadian earth science industries. (13)	Business opportunities for Canadian companies are publicized. (13)
↑	↑ **Performance Measures** ↑		↑
Demand by industry for unique marine survey equipment. (1) Successful development and testing of new techniques and technologies. (7) Meeting of contracting-out targets. (11) Meeting of production deadline. (13)	Meeting of contracting-out targets. (11)	Number of requests for advice from Canadian companies. (1) Success of GSC-industry partnerships. (6) Renewed and additional partnerships. (6)	Information about the application and adoption of GSC bottom characterization techniques by the marine sector. (1) Demand for GSC marine equipment. (1) Reports from Canadian marine survey companies on the efficacy of new instrumentation. (4) Reports of new GSC techniques and technologies being used by government, industry and universities. (6,7) Number of Canadian private sector companies receiving VMAP1 contracts. (11)

Objective 2.2: Industry Support

Strategy 2.2.2: Support to Canadian Businesses

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Incorporate, update and expand databases for gold, porphyry, nickel, SEDEX and VMS in the World Mineral Deposits database. (7)	Expand the World Geology Map by incorporating data on additional mineral deposits. (7)	Exploration and mining companies, and international governments. (7)	Understanding of the relationships between global tectonics and regional settings of mineral deposits improves. (7) Canadian companies conduct mineral exploration more effectively in Canada and on the global scene. (7)
Implement the northern Brazil hydrogeology project (Canada–Brazil II Project), subject to CIDA funding. (7)	Complete the Canada–Brazil hydrogeology project. (7)	CIDA, Brazilian federal and state governments, and Canadian industry. (7)	Brazilian agencies use Canadian hydrogeology management techniques and technologies. (7) The socio-economic effects of drought in northeastern Brazil are mitigated. (7) An expanded market for Canadian companies is created in Brazil. (7)
Provide consulting and quality assurance for international mapping projects. (11)	Ongoing. (11)	The Canadian private sector and international clients. (11)	International visibility for Canadian expertise is increased. (11)
Generate $20-million worth of geomatics projects internationally. (13)	Ongoing. (13)	Canadian industry. (13)	International contracts are awarded to Canadian earth science companies. (13)
↑	↑ **Performance Measures** ↑		↑
Successful addition of new databases into the World Mineral Deposits database. (7) Successful implementation of Brazil groundwater project. (7) Revenues of $460 000 to ESS and $1.1 million to industry from the Mozambique project. (11) Value of international projects. (13)	Revenues of $320 000 to ESS and $1.0 million to industry from the Mozambique project. (11)	Sales of products. (7) Number of new and renewed industry partnerships (7) CIDA funding granted. (7) Number of international clients. (11) Number of Canadian companies collaborating with ESS to win international contracts. (13)	Implementation of Canadian hydrogeology management techniques in Brazil. (7) Number and value of international contracts obtained by Canadian companies with ESS assistance. (11,13) Value of contracts let annually. (13)

Objective 2.2: Industry Support

Strategy 2.2.3: Technology Transfer

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop Synthetic Aperture Radar (SAR) processor technology for Envisat. (10)	Develop and demonstrate a hyperspectral image processor system by 2002/2003. (10) Develop stand-alone SAR processor technology for RADARSAT-2. (10) Develop a follow-up GlobeSAR technology transfer program in South America for the exploitation of RADARSAR-2 data. (10)	Canadian industry. (10)	Data sales increase. (10) Industry integrates processor technology into existing image analysis systems. (10)
Transfer analysis applications to industry for using earth observation (EO) data in land use change mapping and for mapping salvageable lumber from burned areas. (10)	Transfer to industry an application developed through an international hyperspectral development partnership. (10)	International governments and Canadian industry. (10)	Leading-edge Canadian technology is developed. (10) Canadian industry uses high-spatial-resolution satellite data. (10)
Begin upgrading the satellite station infrastructure for RADARSAT-2. (10)	Complete upgrades. (10)	Industry, provincial governments and forest fire centres. (10)	The receiving station is maintained. (10)
Develop and commercialize an integrated forest fire monitoring operational system. (10)		Canadian industry. (10)	Operational use of EO data. (10)
Review, develop and administer intellectual property (IP) licences. (13)	Ongoing. (13)	ESS and private sector partners. (13)	Revenues and benefits continue to flow to ESS. (13)
↑	↑ **Performance Measures** ↑		↑
Development of the single-beam mode Envisat SAR processor is completed. (10) Number of new and renewed IP licences. (13)	Development of the multi-beam mode Envisat SAR processor. (10) Completion of CCRS station upgrades for RADARSAT-2 by 2002/2003. (10)	Level of participation by Canadian industry. (10)	Value of data sales. (10) Feedback about the adoption of technology by Canadian industry. (10) Number of Canadian companies marketing SAR processor technology. (10) Absence of litigation and formal complaints. (13)

Objective 2.2: Industry Support

Strategy 2.2.4: Competitive Ability of Canadian Industry

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Continue demonstrating Canada's leading role and expertise in coastal zone management by participating in international regional geoscience activities (the Coordinating Committee for Coastal and Offshore Geoscience Programmes [CCOP] in East and Southeast Asia, South Pacific Applied Geoscience Commission [SOPAC]). (1)	Ongoing (1)	The marine industry, CCOP and SOPAC. (1)	The technology capacity of Canadian exploration and service companies is enhanced. (1)
Continue to improve China's organic geochemistry capacity through joint projects. (3)	Ongoing. (3)	The geochemical industry, China and CIDA. (3)	Canada–China relations are improved. (3) Economic opportunities for Canadians are enhanced. (3) New geochemical and oil and gas knowledge is developed. (3)
Support five outgoing and 20 incoming trade missions. (13)	Ongoing. (13)	Canadian delegations, international delegations and the NRCan mission office. (13)	International awareness of Canadian earth science capabilities increases. (13)
Promote geomatics and geoscience industries in Latin America. (13)	Ongoing. (13)	The Buenos Aires trade post. (13)	Opportunities for Canadian industry are created. (13)
Coordinate ESS exhibits nationally and internationally. (13)	Ongoing. (13)	The ESS exhibits committee and the global earth science community. (13)	Awareness of ESS and Canadian earth science activities increases. (13)
↑	↑	**Performance Measures** ↑	↑
Number of delegations supported. (13)		Level of GSC participation in international geoscience activities. (1) Number of Canadian companies participating in NRCan trade missions. (13) Number of ESS exhibits held nationally and internationally. (13)	

Objective 2.2: Industry Support

Strategy 2.2.5: Canadian Active Control System

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Foster the development of spatial reference infrastructure technologies and their applications. (8)	Ongoing. (8)	GEOIDE National Centres of Excellence (NCE), industry, Environment Canada, NRC and the Centre for Research for Earth and Space Technology (CRESTech). (8)	Development of spatial reference infrastructure technologies and their applications is fostered. (8)
Improve the Canadian Geodetic Information System for client access. (8,22)	Ongoing. (8)	The Canadian geomatics industry. (8)	Coordinated project work is conducted with GEOIDE NCE, OGDs and academic partners. (8)
Transfer technology for active control and gravimetry systems. (8)	Ongoing. (8)	GEOIDE NCE, OGDs and academic partners. (8)	Active control technology for positioning and related applications is established. (8)
Promote ESS expertise, information, products and services at trade shows and conferences. (8+ESS)	Ongoing. (8+ESS)		Airborne gravimetry technology is enhanced. (8)
↑	↑ **Performance Measures** ↑		↑
Level of participation at trade shows, conferences, and national and international meetings. (8+ESS)		Level of GSD involvement in the GEOIDE NCE. (8)	Establishment of an initial coordinated project to advance active control and gravimetry technologies for positioning and related applications. (8)

Objective 2.3: **Rural, Remote and Aboriginal Communities: Assist in building the capacity of rural, remote and Aboriginal communities, and fulfill responsibilities under self-government agreements, Comprehensive Land Claims legislation, and the Treaty Land Entitlement and Specific Land Claims programs.**

Objective 2.3: **Rural, Remote and Aboriginal Communities**

Strategy 2.3.1: Support for Aboriginal Self-governance

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Provide training. (9)	Ongoing. (9)	Aboriginal land managers and decision-makers. (9)	The capacity of Aboriginal communities to manage their property rights infrastructure and support training opportunities for Aboriginal people is increased. (9)
↑	↑ **Performance Measures** ↑		↑
		Number of persons receiving training. (9)	

Objective 2.3: **Rural, Remote and Aboriginal Communities**

Strategy 2.3.2: Adapting the CLSS in Northern Communities

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Facilitate training opportunities. (9)	Ongoing. (9)	Land managers and decision-makers in Aboriginal communities. (9)	The Canada Lands Survey System is adopted. (9)
Participate in negotiations to adapt the Canada Lands Survey System to individual needs. (9)	Ongoing. (9)	Land managers and decision-makers in Aboriginal communities. (9)	Clients are satisfied. (9)
↑	↑ **Performance Measures** ↑		↑
Value of contracts let to Aboriginal-owned companies. (9)	Value of contracts let to Aboriginal-owned companies. (9)	Number of meetings held. (9)	

Objective 2.3: Rural, Remote and Aboriginal Communities

Strategy 2.3.3: Fulfilling Land Claim and Treaty Responsibilities

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Manage over $9-million worth of survey contracts. (9)	Ongoing. (9)	First Nations bands, northern Aboriginal communities, INAC, and private sector survey and logistics firms. (9)	
↕	↕ **Performance Measures** ↕		↕
Value of contracts let to private sector survey and logistics firms. (9)			Proportion of clients rating Legal Services Division (LSD) services as "excellent". (9)

Objective 2.3: Rural, Remote and Aboriginal Communities

Strategy 2.3.4: Geoscientific and Geospatial Capacity-building

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Advise Aboriginal communities on coastal stability. (1)	Ongoing, including Beaufort Sea communities. (1)	Aboriginal communities, other local communities, N.W.T., the Yukon, Nunavut, INAC and land claims decision-makers. (1)	Relations with northern communities improve. (1)
Participate in northern development workshops to help Aboriginal groups and communities understand and develop their natural resources. (3-7,9)	Ongoing. (3-7,9)	Aboriginal communities, other local communities, N.W.T., the Yukon, Nunavut, INAC and land claims decision-makers. (3-7,9)	Northern communities gain knowledge and access to expertise, information and an enhanced standard of living. (3-7,9)
Establish an infrastructure for natural resource management based on EO data in selected communities. (10)	Develop tools to integrate geomatics and traditional knowledge for environmental monitoring in Aboriginal communities. (10)	Rural and Aboriginal communities. (10)	EO data is used in reserve management practices. (10)
Create metadata for the themes in the Canadian Communities Atlas and make this searchable on the Canadian Earth Observation Network. (10,22)	Ongoing. (10,22)	Schools and communities. (10)	The visibility of community issues in the context of other information is increased. (10)
Engage schools in the Canadian Communities Atlas project and encourage similar projects. (10,22)		Schools and communities. (10)	The Canadian Communities Atlas becomes a more valuable resource to communities than before. (10)

Objective 2.3: Rural, Remote and Aboriginal Communities

Strategy 2.3.4: Geoscientific and Geospatial Capacity-building (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Extend the theme on resource-dependent communities in the National Atlas of Canada by adding geospatial resources such as Toporama, USGS TerraServer and Statistics Canada Community Profiles. (10,22)		Communities and government agencies. (10)	The national and international context of issues is readily available on the Internet because, when searched, all servers in the world with metadata holdings that match the search criteria will respond with related data sets. (10)
Develop an ESS approach to Aboriginal issues and ensure its alignment with the NRCan Aboriginal Strategy. (14)	Engage Aboriginal communities in the development of an ESS approach to meeting Aboriginal needs. (14)	Aboriginal communities that use or could use ESS knowledge and information. (14)	The capacity of Aboriginal communities to use ESS knowledge and information is developed. (14)
Lead the ESS contribution to the NRCan Community Capacity Building (CCB) Strategy. (14)	Help implement the NRCan CCB Strategy. (14)	Rural, remote and northern communities identified as best able to use ESS knowledge and information. (14)	Rural, remote and northern communities have the capacity to use ESS knowledge and information when responding to community needs. (14)
Provide geospatial data, tools and expertise via the Internet as part of the Sustainable Communities Initiative (SCI). (15,22)	Ongoing. Develop and provide local geospatial information and data. (15,22)	Beneficiaries Rural, remote and Aboriginal communities. (15)	Access to geospatial information for local decision-making increases. (15)
	Develop a web portal. (15,22)	Partners AAFC, EC, HC, HRDC, IC, INAC, NRCan, Service Canada and Statistics Canada. (15)	
↑	↑ **Performance Measures** ↑		↑
Infrastructure completed for selected communities. (10) Number of Canadian Communities projects underway. (10) Stakeholder feedback. (14)	Number of tools developed for Aboriginal communities. (10) Stakeholder feedback. (14)	Participation in the Canadian Communities Atlas project (target is 100 schools per year). (10) Number of Aboriginal and First Nation communities that choose to participate. (14)	Information about the use of atlases. (10) Proportion of clients rating ESS services as "excellent". (14)

Objective 2.4: **Northern Research: Provide logistical support and capacity-building to enhance the S&T knowledge base for the sustainable development of the North's natural resources and decision-making on climate change, environmental protection and land-use planning.**

Objective 2.4: **Northern Research**

Strategy 2.4.1: Support for Arctic Research

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Expand and formalize logistics co-delivery collaborations. (12)	Ongoing. (12)	Research community and logistics providers. (12)	Collaboration, efficiency and cost savings increase. (12)
Leverage funding through cost-sharing arrangements. (12)	Ongoing. (12)	Federal departments, territorial government agencies, northern resource co-management agencies, Canadian universities and non-Canadian clients. (12)	Forty percent of total logistics expenditures are recovered annually. (12) Twenty percent of annual cost recoveries are made from international sources. (12)
Procure goods and services from Aboriginal sources (target is $1 million per year). (12)	Ongoing. (12)	Aboriginal service providers and suppliers, and northern communities. (12)	A minimum of $1 million in supplies and services is procured from Aboriginal suppliers annually. (12)
Seek increased A-base funding to support research. (12)	Ongoing. (12)	The Canadian Arctic research community. (12)	Funding and ability to meet client demands increase. (12)
Manage a web site that provides a link to an inventory of logistics services and facilities for northern sites. (12,22)	Ongoing. (12,22)	Circumpolar service providers and the Canadian Arctic research community. (12)	Sharing of knowledge increases and common links are established. (12)

↑	↑ Performance Measures ↑	↑
Extent of collaborations. (12) Cost recoveries. (12) Meeting of Aboriginal procurement targets. (12)	Number of MOUs signed with logistics co-deliverers. (12) Identification, creation and pursuit of funding opportunities. (12)	Number of new MOUs and collaborations. (12) Demonstrated efficiencies. (12) Meeting of cost-recovery targets. (12) Meeting of annual targets. (12) Amount of A-base funding received. (12)

Objective 2.4: **Northern Research**

Strategy 2.4.2: Geoscience and Geomatics Capacity-building in the North

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Collaborate with partners to provide real-time GPS Corrections in the North. (8,22) Extend the Canadian Base Network (CBN) in the North. (8)	Ongoing. (8)	LSD, the Government of Nunavut and GPS positioning users in northern regions. (8)	A seamless augmented GPS infrastructure that includes the northern region is established. (8)
Develop hyperspectral-based information products for mineral exploration in Arctic environments. (10)	Ongoing. (10)	Federal and territorial governments and industry. (10)	Information is provided for decision-making regarding resource development in northern environments. (10)
Locate funding to revitalize the Northern Land Use map series. (10)	Begin the Northern Land Use map project, complete the database and make it available on the Internet. (10,22)	Land-use planners, OGDs, and provincial and territorial governments. (10)	Northern Land Use maps provide a valuable framework for other data sets. (10)
Seek increased A-base funding to support research. (12)	Ongoing. (12)	The Canadian Arctic research community. (12)	Increased funding enables the Polar Continental Shelf Project (PCSP) to meet client demands. (12)
Coordinate and manage the ESS Northern Network. (12,20) Provide support to the NRCan Northern Issues Working Group and the Interdepartmental Committee on Northern S&T. (12,20)	Ongoing. (12,20)	ESS clients and stakeholders, NRCan and OGDs. (12,20)	Information to help develop consensus on NRCan program decisions is provided. (12,20)
Provide policy support for ESS activities in the North. (14)	Ongoing. (14)	ESS clients and stakeholders, NRCan and OGDs. (14)	ESS policy information is provided to help guide programming decisions. (14) Clients are satisfied. (14) An enhanced geoscience and topographic knowledge base is developed. (14)
Operate the Canada–Nunavut Geoscience Office (C-NGO) in partnership with INAC and the Nunavut Department of Sustainable Development (NDSD) to provide accessible geoscience information and expertise in Nunavut. (21)	Ongoing. (21)	Beneficiaries Nunavut communities and resource exploration companies. (21) Partners NDSD and INAC. (21)	A regional facility is created with expertise related to Nunavut geoscience needs. (21) Associations, communities and the Government of Nunavut eventually operate the regional geoscience facility. (21)

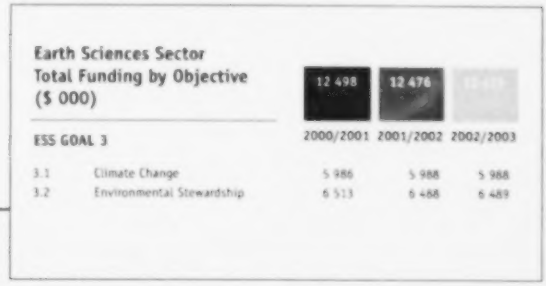
Objective 2.4: **Northern Research**

Strategy 2.4.2: Geoscience and Geomatics Capacity-building in the North (continued)

		Performance Measures	
Establishment of CBN stations in the North. (8) Acquisition of funding. (10) Completion of staffing at the C-NGO. (21) Annual development of a plan for research activities by collaborators. (21)	Contracts in place and conversion started. (10) Accessibility of database on GeoGratis. (10)	Collaborative agreements, as required to achieve GPS•C distribution. (8) Information about the use of map products by clients. (10) Client demand for Arctic research support. (12) Number of geomatics and geoscience capacity-building partnerships in the North. (14) Number of requests for published and unpublished Nunavut geoscience information. (21) Number of requests from Nunavut communities for workshops and presentations. (21)	Availability of a seamless augmented GPS infrastructure that includes the northern region by 2001. (8) Anecdotes about the use of hyperspectral-based information for decision-making. (10) Client surveys and feedback about PCSP support to clients. (12) Client feedback on policy support from ESS. (14) Successful transfer of C-NGO operation to the Government of Nunavut. (21)

ESS Goal 3: Provide geospatial and geoscientific knowledge to minimize the impacts of land use, natural resource development and climate change.

Objective3.1: **Climate Change: Understand the earth science aspects of the impacts of climate change and extreme climate events on Canada and, with partners, develop strategies to minimize and adapt to these impacts.**



Objective 3.1: **Climate Change**

Strategy 3.1.1: Earth Science Aspects

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Publish maps and data on paleo-shorelines in Atlantic Canada. (1)	Ongoing. (1)	Provinces and territories. (1)	An enhanced capacity to assess local and regional sensitivity and vulnerability to climate change is developed and allows responsible agencies to include adaptation measures in long-term planning. (1)
Adopt models for predicting climate change and devise strategies to adapt. (1)	Ongoing. (1)	Provinces, coastal communities, Environment Canada (EC) and other government departments (OGDs). (1)	Models are used in multi-disciplinary assessments of the potential impacts of climate change. (1)
Initiate investigations on the impact of climate change on aquifer recharge, groundwater flow and water resources. (2,5)	Complete reports by 2003. (2,5)	Territories, provinces, the federal government, and regional and municipal land-use planners. (2,5)	Understanding of mechanisms of slope movement improves. (2,5)
Develop models linking slope movement to climate variables. (2,5)	Develop management strategies with partners for dealing with change in risk for transportation corridors and pipelines. (2,5)	N.W.T., the National Water Research Institute (NWRI), the Sahtu Regional Development Board, territories, local northern governments, transportation planning agencies, land-use planning agencies, Carleton University, Tokyo Gas and Transcanada. (2,5)	Understanding of the risks posed by climate change to the transportation and pipeline infrastructure improves. (2,5)
Investigate the vulnerability of select municipalities to climate change by monitoring permafrost melt, hydrogeological change, sea level rise, drought, flood frequency, landslides and forest fires. (1,2,3,5)	Establish regional nodes for the Canadian Climate Impacts and Adaptation Research Network. (1,2,3,5)	The Federation of Canadian Municipalities, Canadian Forest Service (CFS), EC, the University of Ottawa and municipal governments. (1,2,3,5)	Understanding of the rate and spatial distribution of modern c[illegible] change is enhanced. [illegible],3,5)

ESS Goal 3: Provide geospatial and geoscientific knowledge to minimize the impacts of land use, natural resource development and climate change.

Objective3.1: Climate Change: Understand the earth science aspects of the impacts of climate change and extreme climate events on Canada and, with partners, develop strategies to minimize and adapt to these impacts.

Objective 3.1: Climate Change

Strategy 3.1.1: Earth Science Aspects

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Publish maps and data on paleo-shorelines in Atlantic Canada. (1)	Ongoing. (1)	Provinces and territories. (1)	An enhanced capacity to assess local and regional sensitivity and vulnerability to climate change is developed and allows responsible agencies to include adaptation measures in long-term planning. (1)
Adopt models for predicting climate change and devise strategies to adapt. (1)	Ongoing. (1)	Provinces, coastal communities, Environment Canada (EC) and other government departments (OGDs). (1)	Models are used in multi-disciplinary assessments of the potential impacts of climate change. (1)
Initiate investigations on the impact of climate change on aquifer recharge, groundwater flow and water resources. (2,5)	Complete reports by 2003. (2,5)	Territories, provinces, the federal government, and regional and municipal land-use planners. (2,5)	Understanding of mechanisms of slope movement improves. (2,5)
Develop models linking slope movement to climate variables. (2,5)	Develop management strategies with partners for dealing with change in risk for transportation corridors and pipelines. (2,5)	N.W.T., the National Water Research Institute (NWRI), the Sahtu Regional Development Board, territories, local northern governments, transportation planning agencies, land-use planning agencies, Carleton University, Tokyo Gas and Transcanada. (2,5)	Understanding of the risks posed by climate change to the transportation and pipeline infrastructure improves. (2,5)
Investigate the vulnerability of select municipalities to climate change by monitoring permafrost melt, hydrogeological change, sea level rise, drought, flood frequency, landslides and forest fires. (1,2,3,5)	Establish regional nodes for the Canadian Climate Impacts and Adaptation Research Network. (1,2,3,5)	The Federation of Canadian Municipalities, Canadian Forest Service (CFS), EC, the University of Ottawa and municipal governments. (1,2,3,5)	Understanding of the rate and spatial distribution of modern climate change is enhanced. (1,2,3,5)

Objective 3.1: Climate Change

Strategy 3.1.1: Earth Science Aspects (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Produce regional posters (hard copy, web enabled and CD-ROM) on climate change for the western Arctic, Nunavut, the Prairies, Ontario, Quebec and the Atlantic provinces. (1,2,3,5,22)	Expand publication of posters to international border areas. (1,2,3,5,22)	Educators, students, provinces, territories, municipalities and the U.S. Geological Survey (USGS). (1,2,3,5)	A heightened awareness of the regional impacts of climate change is promoted. (1,2,3,5)
Conduct multi-disciplinary research around Vancouver Island to assess the distribution, formation and dissociation processes of marine gas hydrates offshore. (4)	Ongoing. (4)	NRCan's Energy Sector, the National Energy Board, Indian and Northern Affairs Canada (INAC), EC, oil and gas companies, the Geological Survey of Japan and the Ocean Drilling Program (ODP). (4)	Understanding of the role of gas hydrates with respect to climate change improves. (4)
Analyze ice cap cores and snow samples to assess the spatial and temporal record of environmental change and pollutants in the Arctic. (5)	Publish reports on the spatial and temporal record of environmental change and pollutants in the Arctic. (5)	Provinces, territories, the four natural resources departments plus Health Canada (5NR), international climate change agencies (the Intergovernmental Panel on Climate Change [IPCC], Global Climate Observing System [GCOS]), western hydro industries, and national and international universities. (5)	Understanding of the rate and spatial distribution of modern climate change improves. (5)
↑	↑ **Performance Measures** ↑		↑
Completion of research and publication of results on schedule. (1-5)	Number of regional nodes established. (1-5)	Number and diversity of client groups and collaborating partners. (2,5) Extent of collaboration. (1-5)	Development and assessment of adaptation strategies. (1-5) Structured changes made by the Federation of Canadian Municipalities and Canadian municipalities to deal with climate change. (1-5) References to GSC's research in relevant climate change documents. (1-5)

Objective 3.1: Climate Change

Strategy 3.1.2: Climate System Dynamics

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Assess and report on the mass balance of benchmark glaciers for signals of climatic variability. (2) Assess and report on the regional state of glacier cover in the Arctic and Cordillera. (5)	Continue research on glacier mass balance in the Arctic and the Cordillera. (2,5)	Provinces, territories, 5NR, international climate change agencies (IPCC, GCOS), western hydro industries, and national and international universities. (2,5)	Understanding of past climate changes and threshold events is enhanced. (2,5)
Conduct studies of past and present impacts of climate change on extreme events (droughts, floods, landslides) in the Prairies, the Red River Valley, the Cordillera and other regions of Canada. (2,3,5)	Evaluate land use and land management adaptation options related to climate change. (2,3,5)	EC, the Prairie Farm Rehabilitation Administration (PFRA), the Prairie Adaptation Research Cooperative (PARC), Parks Canada, the Saskatchewan Research Council (SRC), provincial parks, universities, and regional and municipal land-use planners. (2,3,5)	The capacity to assess local and regional sensitivity and vulnerability to climate change is enhanced and allows responsible agencies to include adaptation measures in long-term planning. (2,3,5)
Publish a report on peat lands of Canada. (5)	Establish a wetlands database for carbon cycle modelling. (5)	Provinces, territories, the Canada Centre for Remote Sensing (CCRS), the University of Alberta, environmental consultants and Agriculture and Agri-Food Canada (AAFC). (5)	The multidisciplinary assessment of the potential impacts of climate change is used to develop and assess adaptation strategies. (5)
Investigate rapid climate system responses and changes that took place during the early to mid-Holocene in northern Canada. (5)	Map the distribution of the Younger Dryas event (climate cooling) in the western Arctic. (5)	The paleoclimate research community, the climate change modelling community, the Intergovernmental Panel on Climate Change (IPCC) and universities. (5)	Understanding of past climate system dynamics and of geological and ecological response to climate change improves. (5)
Design a drilling program on Mount Logan to research the Holocene record of climate change in the western Arctic and Pacific Ocean. (5)	Conduct a drilling program on Mount Logan. (5)	Provinces, territories, 5NR, international climate change agencies (IPCC, GCOS), western hydro industries, and national and international universities. (5)	Canadian capabilities to meet international obligations under the International Hydrological Programme of the United Nations Educational, Scientific and Cultural Organization and under GCOS-WMO are improved. (5)
Investigate and report on glacial and sea level history on parts of Axel Heiberg and Ellesmere islands. (5)	Complete reports on glacial and sea level history. (5)	Universities, OGDs, and the climate change modelling and impact assessment communities. (5)	Understanding of the geological response to climate change and of past climate system dynamics improves. (5)
↑	↑ **Performance Measures** ↑		↑
Completion of field studies and reports on schedule. (2,3,5)		Establishment of a wetlands database. (5)	Meeting of international obligations. (5)

Objective 3.1: Climate Change

Strategy 3.1.3: Carbon Sinks

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Map the ability of Canada's forests to absorb carbon from the atmosphere. (10)	Develop an international terrestrial carbon observation strategy by 2002. (10)	ESS, NRCan, the Canadian Forest Service, OGDs, provinces and territories. (10)	EO data is used to report on greenhouse gas cycles and forest ecosystem trends. (10)
Provide a high-quality ground control points database. (10,22)	Complete coverage of Canada with quality Landsat-7 products by 2002/2003. (10,22)		
↑	↑ **Performance Measures** ↑		↑
Availability of database of ground control points. (10)	Completion of coverage of Canada on schedule. (10) Development of strategy on schedule. (10)	Number of provinces and territories mapped. (10)	Anecdotes and information about the use of EO data to report on ecosystem trends. (10)

Objective 3.1: Climate Change

Strategy 3.1.4: Earth Science Information for Policies and Protocols

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop Geographic Information System (GIS)-based permafrost and risk assessment models. (5) Investigate the potential impacts of climate change on permafrost. (5) Investigate the potential impacts of climate change on northern oil and gas industries, transportation, municipal infrastructure and movement of contaminants from industrial waste. (5)	Continue expanding the ground thermal modelling capability in areas of continuous and discontinuous permafrost. (5)	Territories, policy-makers, land-use planners, and the oil and gas industry. (5)	The capacity to assess local and regional sensitivity and vulnerability to climate change is enhanced. (5)
Develop new strategies for sustainable glacier and water resource monitoring using ground-based technology and remote sensing. (5,10)	Test technologies developed in Year 1. (5)	Provinces, territories, 5NR, international climate change agencies (IPCC, GCOS), western hydro industries, and national and international universities. (5)	Understanding of the relationship between climate change, Cordilleran glaciers and water resources improves. (5)
Assess and report on the mass balance of benchmark glaciers for signals of climate variability and the regional state of glacier cover in the Arctic and the Cordillera. (5)	Ongoing. (5)		Understanding of past climate changes and threshold events is enhanced. (5)
↑	↑ **Performance Measures** ↑		↑
Completion of studies on schedule. (5)		Number of select municipalities investigated for vulnerability to climate change. (5)	

Objective 3.1: Climate Change

Strategy 3.1.5: Geodetic and Geodynamic Knowledge

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Measure post-glacial tilt in Manitoba through continuous geodetic (Global Positioning System [GPS] and absolute gravity) observations. (4)	Integrate geodetic and geomorphological data to determine rates of post-glacial rebound. (4)	Beneficiaries The international glacial rebound research community, Lake Winnipeg property owners and Manitoba Hydro. (4) Client The Government of Manitoba. (4) Partners Manitoba Hydro, NASA and the Geodetic Survey Division (GSD). (4)	A Laurentide post-glacial rebound model is developed. (4) Understanding of the rates and magnitude of paleoclimate change improves. (4) A predictive model for calculating hydroelectric generation capacity from Lake Winnipeg outfall is developed. (4)
Promote understanding and accessibility of GSD products, servires and operations for sustainable development and environmental applications. (8) Participate in international GPS, Very Long Baseline Interferometry (VLBI) and gravity services with links to climate change studies. (8)	Ongoing. (8)	Universities, OGDs and researchers, including those involved in the GEOIDE National Centres of Excellence (NCE), the Centre for Research for Earth and Space Technology (CRESTech), the International GPS Service (IGS), the International VLBI Service (IVS) and the International Earth Rotation Service (IERS). (8)	Use of geodetic products and services for global change studies increases. (8) IERS uses GSD contributions to monitor global geophysical fluids. (8) The best realization of the inertial and terrestrial reference frames for global change monitoring is provided. (8) Understanding of interactions and evolution of global geophysical fluids improves. (8)
↑	↑ **Performance Measures** ↑		↑
Completion of field observations on schedule. (4) Field results that permit development of a post-glacial rebound model. (4)		Continued discussion and requests for knowledge from clients and beneficiaries. (4) Information about the use of the geodetic infrastructure by the IERS for climate change studies. (8)	Citations about the use of the predictive model for determining the capacity for generating hydroelectricity from Lake Winnipeg. (4) Information about how geodetic and geodynamic knowledge is being used to monitor global change. (8)

Objective 3.2: **Environmental stewardship: Provide geoscience and geospatial knowledge required for environmental policy and risk management of the impacts of natural resources and infrastructure development and use in Canada.**

Objective 3.2: **Environmental Stewardship**

Strategy 3.2.1: Impacts of Infrastructure Development

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Release maps and reports on marine landslides, sediment transport, coastal erosion and ice scouring affecting offshore structures. (1,4)	Release maps and reports on seabed stability issues related to marine pipeline and sub-sea structures. (1)	The pipeline industry, land-use planners and provincial agencies. (1,4)	Better decisions are made concerning the location or routing of structures such as pipelines, cables, highways, railways and production platforms after geoscience information relevant to structural performance is considered. (1,4)
Develop data sets, analytical models and visualization tools that will help communicate policy options and impacts. (10)	Ongoing. (10)	Canadian industry, policy-makers and the public sector. (10)	Costs to acquire high-spatial-resolution satellite data are minimized. (10) Models are sufficiently sophisticated to be used to evaluate policy. (10)
Build partnerships with organizations, such as universities, that have an interest in contributing national scale models. (10)		Universities, and private and public sector organizations. (10)	The public sector is informed about policies that influence its well-being. (10)
↑	↑ **Performance Measures** ↑		↑
Release of maps and reports on schedule. (1,4) Number of data sets, analytical models and visualization tools developed. (10)	Number of models improved. (10)	Number of bilateral and multi-lateral research agreements. (10) Number of partnerships with organizations. (10)	Cost of acquiring high-spatial-resolution satellite data. (10)

Objective 3.2: Environmental Stewardship

Strategy 3.2.2: Anthropogenic Substances

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Publish emissions research at selected Alberta and Saskatchewan sites, and at Trail, B.C., and initiate monitoring at Thompson, Manitoba. (3)	Finalize and publish emission research at other selected Alberta sites. (3)	Inco, Cominco, ATCO, provincial regulators, EC, NGOs and local communities. (3)	Understanding of emissions from coal-fired utilities and mine smelters, and their downwind dispersal, improves. (3)
↑	↑ **Performance Measures** ↑		↑
Publication of research in a peer-revised journal. (3) Installation of monitoring equipment. (3) Number of emissions research papers published. (3)			Evidence attesting to the use of ESS emissions research by decision-makers. (3)

Objective 3.2: Environmental Stewardship

Strategy 3.2.3: Environmental Monitoring

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Complete technical reviews and provide federal geoscience advice on enviornmental impact assessments, as required under the *Canadian Environmental Assessment Act*. (1-7)	Complete reviews of assessments, as required. (1-7)	NRCan, the Office of Environmental Affairs (OEA), the Canadian Environmental Assessment Agency (CEAA), industry, and provincial and territorial environmental impact agencies. (1-7)	Formal environmental assessments and reviews are more robust because appropriate geoscience information is considered. (1-7)
Produce maps and reports on Metals in the Environment (MITE) projects that establish the effects of weathering on metals and distinguish natural and anthropogenic sources of metals in peat and surficial sediments. (1,2,3,5,7)	Analyze, write up and report on MITE field results. (1,2,3,5,7)	The Mining Association of Canada, EC, AAFC, geochemists and Carleton University. (1,2,3,5,7)	Breakthroughs are made in the scientific understanding of the source, transport, transformations and fate of metals in the environment. (1,2,3,5,7) New mapping and measurement systems enable prediction of the behaviour of surficial materials under structural and extreme natural stresses. (1,2,3,5,7)

Objective 3.2: Environmental Stewardship

Strategy 3.2.3: Environmental Monitoring (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Conduct research on natural levels and natural processes of potentially toxic metals (such as mercury) under the MITE program. (7) Publish results of the Kejimkujik studies. (7)	Ongoing. Produce maps of areas with high cadmium content. (7)	AAFC, EC, provincial agriculture agencies and organizations, provincial governments and environmental industries. (7)	Provincial agronomists and grain producers use MITE program information to avoid planting grain in areas of high cadmium content. (7) Risk assessments and management strategies related to potentially toxic substances in the environment are integrated into strategic planning. (7) MITE program results are considered in the development of Canadian and international legislation on environmental matters. (7)
↑	↑ **Performance Measures** ↑		↑
Number of environmental assessment reviews completed. (1-7) Completion of MITE projects on schedule. (1,2,3,5,7) Completion of research and publications on schedule. (7)		Number and diversity of client groups and collaborating partners. (1,2,3,5,7) Number of new and renewed partnerships with the related agriculture community and agencies. (7) Number of requests for information. (7)	Evidence that OEA and OGDs recognize and seek geoscience expertise to protect the environment and to improve engineering design and environmental impact mitigation. (1-7) Evidence that crop distribution has been partly influenced by GSC toxic metals data. (7) Acknowledgments that MITE program information was used to develop land-use policies. (7) Citations from client groups on the usefulness of GSC information. (7)

ESS Goal 4: Provide geospatial and geoscientific knowledge to enhance the safety and economic security of Canadians.

Objective 4.1: **Hazards and Emergencies: Deliver authoritative data, information, advice and support to those responsible for avoiding and mitigating the impact of, and responding to, natural hazard emergencies and disasters.**

Earth Sciences Sector Total Funding by Objective ($ 000)

ESS GOAL 4		2000/2001	2001/2002	2002/2003
4.1	Natural Hazards and Emergencies	16 258	16 857	17 051
4.2	Comprehensive Test Ban Treaty	472	617	527
4.3	Boundaries	942	942	942
4.4	Property Rights and Surveys	3 136	3 126	3 123
4.5	Navigation	2 366	2 350	2 350

Objective 4.1: **Natural Hazards and Emergencies**

Strategy 4.1.1: Emergency Preparedness

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Determine the location and magnitude of Canadian earthquakes and notify clients rapidly. (4)	Ongoing. (4)	Clients and beneficiaries Utilities (Hydro Quebec, Ontario Hydro, B.C. Hydro), Atomic Energy of Canada Ltd. (AECL), transportation companies, the media, the general public, provincial and municipal emergency preparedness groups. (4) Partners Utilities. (4)	The media, emergency agencies in Canada and international scientific groups recognize and rely upon NRCan as the principal source of reliable earthquake information. (4)
Revise inter-agency emergency operating procedures annually. (4)	Ongoing. (4)		Relevant emergency and media agencies' response to earthquakes improves. (4)
Update emergency operating procedures, including the Event Notification Plan. (4)	Ongoing. (4)	Interagency Volcanic Ash/ Hazard Working Group (Transport Canada [TC], Nav Canada, Environment Canada [EC] and Emergency Preparedness Canada [EPC]). (4)	Agencies work together to respond to volcanic events. (4) Information is relayed to appropriate bodies to avert damage to aircraft and possible loss of life. (4)
Monitor daily and long-term variations of the earth's magnetic field, and provide magnetic declination and magnetic field intensity measurements across Canada. (4)	Ongoing. (4)	Clients and beneficiaries Geomatics Canada (GC), Nav Canada, directional drilling companies, satellite dish owners, topographic map and aeronautical chart users. (4)	Accurate directional information for navigators is provided. (4) Public safety is protected. (4)
Develop a long-term implementation plan for space weather prediction as an element of the space environment component of Canada's Space Plan. (4)	Develop and incorporate new methodologies and algorithms for using interplanetary magnetic field and solar wind data to produce routine space weather forecasts. (4) Ongoing. (6)	Clients and beneficiaries Telecommunications industries, the electric power industry, and the pipeline industry. (4) Partners The Canadian Space Agency, Canadian universities. (4)	Client groups use space weather forecasts. (4) The reliability of satellite-based communications, ocean-cable communications and electric power transmission improves. (4) Corrosion prevention on pipelines improves. (4)
Continue seismic and aeromagnetic studies of the basement structure in the vicinity of Lake Ontario. (6) Publish journal papers, Open Files, databases and information on a web site. (6,22)	Ongoing. (6)	Partners and beneficiaries Ontario Power Generation (OPG), Orion Resources, the U.S. Geological Survey (USGS), the Multidisciplinary Center for Earthquake Engineering Research. (6)	Understanding of the relationship between the basement and sedimentary cover and neo-tectonics improves. (6)

ESS Goal 4: Provide geospatial and geoscientific knowledge to enhance the safety and economic security of Canadians.

Objective 4.1: **Hazards and Emergencies: Deliver authoritative data, information, advice and support to those responsible for avoiding and mitigating the impact of, and responding to, natural hazard emergencies and disasters.**

Objective 4.1: **Natural Hazards and Emergencies**

Strategy 4.1.1: Emergency Preparedness

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Determine the location and magnitude of Canadian earthquakes and notify clients rapidly. (4)	Ongoing. (4)	Clients and beneficiaries Utilities (Hydro Quebec, Ontario Hydro, B.C. Hydro), Atomic Energy of Canada Ltd. (AECL), transportation companies, the media, the general public, provincial and municipal emergency preparedness groups. (4)	The media, emergency agencies in Canada and international scientific groups recognize and rely upon NRCan as the principal source of reliable earthquake information. (4)
Revise inter-agency emergency operating procedures annually. (4)	Ongoing. (4)	Partners Utilities. (4)	Relevant emergency and media agencies' response to earthquakes improves. (4)
Update emergency operating procedures, including the Event Notification Plan. (4)	Ongoing. (4)	Interagency Volcanic Ash/ Hazard Working Group (Transport Canada [TC], Nav Canada, Environment Canada [EC] and Emergency Preparedness Canada [EPC]). (4)	Agencies work together to respond to volcanic events. (4) Information is relayed to appropriate bodies to avert damage to aircraft and possible loss of life. (4)
Monitor daily and long-term variations of the earth's magnetic field, and provide magnetic declination and magnetic field intensity measurements across Canada. (4)	Ongoing. (4)	Clients and beneficiaries Geomatics Canada (GC), Nav Canada, directional drilling companies, satellite dish owners, topographic map and aeronautical chart users. (4)	Accurate directional information for navigators is provided. (4) Public safety is protected. (4)
Develop a long-term implementation plan for space weather prediction as an element of the space environment component of Canada's Space Plan. (4)	Develop and incorporate new methodologies and algorithms for using interplanetary magnetic field and solar wind data to produce routine space weather forecasts. (4) Ongoing. (6)	Clients and beneficiaries Telecommunications industries, the electric power industry, and the pipeline industry. (4) Partners The Canadian Space Agency, Canadian universities. (4)	Client groups use space weather forecasts. (4) The reliability of satellite-based communications, ocean-cable communications and electric power transmission improves. (4) Corrosion prevention on pipelines improves. (4)
Continue seismic and aeromagnetic studies of the basement structure in the vicinity of Lake Ontario. (6) Publish journal papers, Open Files, databases and information on a web site. (6,22)	Ongoing. (6)	Partners and beneficiaries Ontario Power Generation (OPG), Orion Resources, the U.S. Geological Survey (USGS), the Multidisciplinary Center for Earthquake Engineering Research. (6)	Understanding of the relationship between the basement and sedimentary cover and neo-tectonics improves. (6)

Objective 4.1: Natural Hazards and Emergencies

Strategy 4.1.1: Emergency Preparedness (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Transfer disaster monitoring methodology to industry. (10)	Demonstrate operational disaster monitoring capability. (10)	Industry, provincial agencies, and the public sector. (10)	Industrial training competence and capability in radar are enhanced. (10)
Integrate *in situ* data and models with RADARSAT data for flood management. (10)	Ongoing. (10)	International aid agencies. (10)	Use of RADARSAT data in disaster monitoring increases. (10)
Develop a methodology that incorporates Synthetic Aperture Radar (SAR) and low-spatial-resolution imagery for hurricane monitoring and weather forecasting. (10)	Ongoing. (10)	Industry, provincial agencies, and the public sector. (10)	Data are available to those responsible for managing emergencies. (10)
Provide an emergency mapping service. (11)	Ongoing. (11)	The Department of National Defence (DND). (11) Government of Canada mapping agencies. (11)	Maps are supplied quickly when national disasters strike. (11)
↑	↑ **Performance Measures** ↑		↑
Meeting of standards for determining earthquakes and reporting to clients. (4) Updating of emergency response plans on schedule. (4) Meeting of standards for magnetic field monitoring operations and production of short- and long-term forecasts. (4) Successful incorporation of magnetic field information in space weather forecasts. (4) Completion of analyses and publications on schedule. (6) Amount of training delivered. (10) Number of models integrated with RADARSAT data. (10) Number of emergency maps produced. (11)	Number of demonstrations of disaster monitoring capability given. (10) Development of a disaster monitoring methodology by 2003. (10)	Web site usage. (4) Number of clients requesting magnetic forecast information. (4) Continued funding for participation in space weather activities. (4) Number of requests for data and publications. (6) Number of clients receiving training. (10) Number of mapping agencies contributing to emergency mapping. (11)	Number of requests for earthquake information by client groups. (4) Use of seismic hazard data by engineering and emergency agencies. (4) Insurance Board of Canada statistics. (4) Information about the use of ESS information for aircraft routing and scheduling in the event of a volcanic eruption. (4) Information about the use of forecasts by public utilities to mitigate service disruptions from magnetic storms. (4) Routine use of magnetic field data to produce space weather forecasts. (4) Reference to the use of ESS crustal tectonic information in determining the site and operation of public utilities. (6) Information about industry adoption of disaster monitoring technology. (10) Response time in simulated and real emergencies. (11)

Objective 4.1: Natural Hazards and Emergencies

Strategy 4.1.2: Nature of Earth Processes

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Provide expert advice on geohazards and natural disasters. (1,2,4,5)	Ongoing. (1,2,4,5)	Federal and provincial governments, policy-makers, regulatory bodies, EPC, the Transportation Safety Board of Canada, the transportation industry and the pipeline industry. (1,2,4,5)	Public and institutional awareness of the risks posed by natural hazards increases. (1,2,4,5)
Develop landslide process models for landslide hazard reduction in Canada. (2,5,7)	Calibrate landslide process models. (2,5,7)	Industry, universities, national parks, the transportation industry, consultants, all levels of government, international governments and agencies. (2,5,7)	Relevant agencies improve their response to hazardous natural events, such as earthquakes, landslides, floods and volcanic eruptions. (2,5,7)
Determine the frequency of landslides. (2,4,5)	Develop temporal landslide models. (2,4,5)	Provincial and local governments, industry, universities, national parks, the transportation industry and consultants. (2,4,5)	Breakthroughs in the scientific understanding of natural hazards are made. (2,4,5)
Conduct research on earthquake sources and mechanisms to determine seismic hazard on the continent and adjacent marine areas. (4)	Conduct research on earthquake sources and mechanisms to determine seismic hazard, which will be used to develop a fifth-generation seismic hazard model. (4)	Beneficiaries Canadian industry and the general public. (4) Clients and partners Structural engineers, provincial and municipal emergency preparedness groups, the Natural Sciences and Engineering Research Council (Building Code), insurance companies (the Insurance Bureau of Canada). (4)	The assessment of seismic hazards throughout Canada improves. (4) Earthquake damage to buildings and infrastructure is mitigated because seismic hazard data are incorporated into the National Building Code. (4)
Conduct multidisciplinary field studies on the magnitude and frequency of extreme floods in the Red River Valley. (5)	Complete field studies and final reports. (5)	Federal, provincial and municipal authorities, universities, regulatory and policy groups. (5)	Relevant agencies improve their response to hazardous natural events, such as earthquakes, landslides, floods and volcanic eruptions. (5)
↑	↑ **Performance Measures** ↑		↑
Number of requests for expert advice on geohazards and natural hazards. (1,2,4,5) Successful development of a seismic hazard model. (4)		Number of requests for geohazard and seismic information from client groups. (1,2,4,5)	Development of an explanation of flood history in the Red River Valley. (1,2,4,5) Use of crustal tectonics information in determining the siting and operation of public utilities. (4) Use of seismic hazard data in Canada's National Building Code. (4)

Objective 4.1: Natural Hazards and Emergencies

Strategy 4.1.3: Global Disaster Information Network

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Document the Geological Survey of Canada (GSC) role in the Federal Nuclear Emergency Response Plan (FNERP). (7) Test mobile gamma-ray monitoring capability. (7)	Contribute to FNERP as required. (7)	Health Canada, DND, AECL and EPC. (7)	Capability to meet FNERP obligations is developed. (7) NRCan responds to nuclear emergencies, as required. (7)
Analyze and apply precise geodetic techniques (Very Long Baseline Interferometry, Global Positioning System [GPS], gravimetry) to studies of global and crustal dynamics. (4,8)	Ongoing. (8)	Researchers in universities and other government departments (OGDs), the GEOIDE National Centres of Excellence (NCE), the Centre for Research for Earth and Space Technology (CRESTech), the International GPS Service and the International VLBI Service. (8)	The best realization of the reference frame for monitoring geodynamics is provided. (8) Information on crustal motion, post-glacial rebound and sea-level changes improves. (4,8)
Contribute to a GEOIDE (NCE) project on natural hazards and disaster monitoring. (8)	Ongoing. (8)	GEOIDE (NCE) and planning agencies. (8)	Understanding of geodynamic interactions and the evolution of Earth systems advances. (8)
↑	↑ **Performance Measures** ↑		↑
Verification of mobile gamma-ray monitoring capability. (7) Number of techniques analyzed and applied to studies of global and crustal dynamics. (8)		Participation with FNERP agencies, as required. (7)	Information about the use of the spatial reference frame for monitoring geodynamics. (8)

Objective 4.2: Comprehensive Test Ban Treaty: Deliver Canada's monitoring service responsibilities under the International Test Ban Treaty.

Objective 4.2: Comprehensive Test Ban Treaty

Strategy 4.2.1: Monitoring and Reporting Seismic Events

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Operate Canada's seismic and infrasound facilities as part of the Comprehensive Test Ban Treaty (CTBT) International Monitoring System (IMS) and continue transmitting data to the Comprehensive Test Ban Treaty Organization (CTBTO) in Vienna. (4)	Ongoing. (4)	Beneficiary Canada and other countries. (4) Clients and partners Department of Foreign Affairs and International Trade (DFAIT), IMS nations and CTBTO. (4)	The CTBTO certifies Canada's new hydroacoustic array. (4) Underground nuclear explosions are rapidly and accurately detected and discriminated. (4)
Begin installing a hydroacoustic monitoring array on the Queen Charlotte Islands. (4)	Optimize the hydroacoustic signal from the Queen Charlotte Islands array. (4)		Information is generated to permit the assessment of CTBT compliance of member nations. (4) Contributions to global efforts to minimize nuclear proliferation are made. (4)
↑	↑ **Performance Measures** ↑		↑
Operation of CTBT monitoring facilities to required standards. (4)		Recognition by CTBTO nations of Canada's strong participation in IMS. (4) CTBTO funding received. (4)	CTBTO certification of Canada's hydroacoustic array monitoring facility is obtained. (4) Information about the use of Canada's monitoring data in CTBT compliance efforts. (4)

Objective 4.3: **Boundaries: In partnership with the United States Section of the International Boundary Commission, maintain an effective boundary line between Canada and the U.S.A., as set out in international treaties. Define Canada's provincial, territorial and federal political boundaries and international offshore boundaries.**

Objective 4.3: **Boundaries**

Strategy 4.3.1: Canada–U.S. Boundary

Strategy 4.3.2: Electoral Boundaries

Strategy 4.3.3: Provincial and Territorial Boundaries

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Maintain the Canada–U.S. boundary—clear 50 km of vista, inspect 350 monuments, repair 75 monuments, inspect 20 control stations, establish 5 new control points and establish 75 control points by GPS. (9)	Maintain the Canada–U.S. boundary—clear 50 km of vista, repair 45 monuments, inspect 350 monuments and 20 control stations, establish 5 new control points and establish 25 control points by GPS. (9)	U.S. State Department, DFAIT, Royal Canadian Mounted Police, Canada Customs and Revenue Agency, U.S. Border Patrol, and stakeholders with interests in the international boundary. (9)	Canada–U.S. boundary is effectively maintained. (9) Boundary-related issues are successfully resolved. (9)
Prepare and verify electoral riding maps and descriptions on request. (9)	Ongoing. (9)	The Chief Electoral Officer of Canada. (9)	Timely technical support is provided, upon request. (9)
Represent the federal government on inter-provincial/territorial boundary commissions. (9)	Ongoing. (9)	The Privy Council Office, provincial and territorial governments. (9)	Provincial and territorial boundary issues are dealt with in a timely manner. (9)
↑	↑ **Performance Measures** ↑		↑
Number and percentage of monuments inspected and control stations inspected. (9) Number of kilometres of vistas cleared, monuments repaired and new control points established. (9)		Stakeholder feedback. (9)	Milestones established in the Long Range Forecast of the Canada–U.S. International Boundary Commission are met. (9) Proportion of clients rating LSD services as "excellent". (9)

Objective 4.3: Boundaries

Strategy 4.3.4: Marine Boundaries and Geoscience Surveys

Deliverables Year 1	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Assemble and rationalize international bathymetric data. (1) Construct a bathymetric grid. (1) Publish a preliminary prospectus for joint continental shelf delimitation in the Arctic Ocean. (1)	Establish a multinational program for developing a joint outer limit of the juridical continental shelf in the Arctic Ocean. (1)	Federal government and international partners. (1)	Compilations contribute to a better understanding of the tectonic framework and history of the Arctic region. (1) A comprehensive data set is developed upon which to base Law of the Sea (LOS) claims. (1) Storm surge predictions improve. (1)
↑	↑ **Performance Measures** ↑		↑
Availability of data sets and preliminary prospectus. (1) Availability of a storm surge model for the Beaufort Sea coast. (1) Availability of storm surge climatology information and models. (1)	Completion of recommendations and a report. (1) Availability of coastal maps for the Beaufort Sea coast and areas of P.E.I. (1)	Acceptance by policy- and decision-makers of information presented. (1) Acceptance of maps and models by decision-makers. (1)	Successful LOS claims. (1)

Objective 4.4: **Property Rights and Surveys: Maintain a national centre for facilitating flexible and adaptable property rights infrastructures that utilize the Canada Lands Survey System. In the role of corporate surveyor for the federal government, regulate all surveys and manage the survey programs of the administering department on Canada Lands.**

Objective 4.4:	**Property Rights and Surveys**
Strategy 4.4.1:	Adapting the CLSS to Individual Needs
Strategy 4.4.2:	Canada Lands Survey Records
Strategy 4.4.3:	Canada Lands Survey System
Strategy 4.4.4:	Land Administration and Management

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Complete the Ballantyne/ Dobbin Study. (9) Update standards for surveys, survey documentation and the *Manual of Instructions for the Survey of Canada Lands*. (9)	Implement the recommendations of the Ballantyne/ Dobbin Study. (9) Ongoing. (9)	First Nations bands, Aboriginal and northern communities. (9)	The social and economic well-being of Canadians with interests on Canada Lands improves. (9) The Canada Lands Survey System is adaptable to the needs of clients. (9)
Maintain digital archives, hard-copy records and delivery of products via the Internet. (9,22)	Ongoing. (9)	All Canadians with land interests on Canada Lands, such as First Nations bands, northern communities, resource developers, Indian and Northern Affairs Canada (INAC), and Parks Canada. (9)	Archival standards are maintained. (9)
Actively participate in committees that support the Association of Canada Lands Surveyors (ACLS) regulation of land surveyors. (9)	Ongoing. (9)	ACLS, all commissioned Canada Lands surveyors and stakeholders across the country. (9)	The ACLS is strengthened. (9)
Manage and issue approximately $2-million worth of survey contracts on behalf of client departments. (9)	Ongoing. (9)	INAC and Parks Canada. (9)	Clients are satisfied. (9)
Provide advice and consultation services. (9)	Ongoing. (9)	Land administrators, system users, First Nations land managers and land managers in northern communities. (9)	

↑	↑ Performance Measures ↑		↑
Completion of Phase 3 of the LSD web project. (9) Number of LSD staff participating on ACLS committees. (9) Value of survey contracts issued and managed. (9)	Number of study recommendations implemented. (9)	Partner feedback. (9)	Socio-economic impact study of the Canada Lands Survey System. (9) Proportion of clients rating LSD services as "excellent". (9)

Objective 4.5: Navigation: Facilitate access to reliable and consistent reference frames for positioning and reliable charts and publications for aviation.

Objective 4.5: Navigation

Strategy 4.5.1: Aeronautical Products

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Publish revised Instrument Flight Rules (IFR) aeronautical charts every 56 days, and 25 of the 75 Visual Flight Rules (VFR) aeronautical charts. (11)	Ongoing. (11)	Civil and military aviation in Canada. (11)	Timely and reliable aeronautical information is available to support the safety and efficiency of aviation in Canada. (11)
Pursue development and market introduction of digital aeronautical products. (11,22)	Launch digital editions of 20 VFR aeronautical charts per year. (11,22)	Aviation institutions in Canada (Nav Canada, DND, TC, Canadian Owners and Pilots Association). (11)	Aviation institutions accept digital products. (11)
↑	↑ **Performance Measures** ↑		↑
Meeting of publication deadlines. (11) Meeting of production targets. (11) Number of corporate licences signed (target is one per year). (11)		Number of clients. (11) Number of aviation institutions having corporate licences to test or use digital aeronautical products. (11)	Percentage of deadlines met (target 100 percent). (11) Revenues from users. (11) Revenues from corporate licences. (11) Renewed ISO 9001 registration. (11)

Objective 4.5: Navigation

Strategy 4.5.2: Canadian Spatial Reference System

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Improve Canadian Spatial Reference System (CSRS) and Geodetic Survey Division (GSD) visibility and accessibility through promotional activities, World Wide Web presence and enhanced online data access. (8,22)	Ongoing. (8)	Provincial geomatics agencies; mapping, charting, timing and non-traditional sectors, such as the farming, forestry, intelligent transportation and navigation communities. (8)	CSRS information and products serve a broader base of positioning and related applications than before. (8) Having a globally consistent spatial reference system as a standard for integrating and sharing georeferenced data creates economic benefits. (8)
Coordinate federal and provincial initiatives to address needs and opportunities related to the CSRS infrastructure. (8)	Ongoing. (8) Explore applications and needs for spatial positioning. (8)	GeoConnections, the Canadian Council on Geomatics, the Canadian Geodetic Reference System Committee and OGDs. (8)	Federal and provincial initiatives are coordinated. (8)
↑	↑ **Performance Measures** ↑		↑
Report on Canadian Geodetic Reference System Committee actions to Canadian Council on Geomatics. (8)		Number of users accessing the GSD web site. (8) Number of non-traditional sectors using CSRS. (8)	Range of applications being served by CSRS. (8) Availability of CSRS as a standard of reference for all positioning in Canada. (8) Client feedback. (8)

ESS Goal 5: Ensure that the Earth Sciences Sector is a forward-looking, rewarding, and effective and efficient workplace, and that it meets the needs of its clients.

Objective 5.1: **Leadership: Provide direction and leadership for Earth Sciences Sector programs and operations in order to contribute to departmental and national activities and policies, with respect to national needs and concerns.**

Objective 5.1: **Leadership**

Strategy 5.1.1: Strategic and Management Improvement Plans

Year 1 Deliverables	Deliverables Years 2 and 3	Reach	Short- and Long-term Results
Complete the Sector's Strategic Overview Document and mid-year update. (14)	Ongoing. (14)	ESS staff, clients, partners and stakeholders. (14)	ESS program and policy priorities are linked to government policy and support good governance. (14)
Support the implementation of the ESS Strategic Plan, including the development of a biannual review framework. (14)	Ongoing. (14)	ESS staff, clients and stakeholders. (14)	The quality of ESS plans, reports and performance management improves. (14)
Coordinate ESS S&T and policy initiatives, including the development of business cases to address capacity gaps. (14)	Implement strategies to address current and future capacity gaps and develop the means to address shortages. (14)	ESS staff, NRCan Sectors and other government departments (OGDs). (14)	Programs and services are effectively delivered and maintained. (14)
Coordinate the annual review of ESS priorities within the context of Government of Canada and NRCan priorities. (14)	Ongoing. (14)	ESS, NRCan and all Canadians. (14)	ESS program and policy priorities are linked to government policy and support good governance. (14)
Consult with, and provide secretariat support to, the Minister's National Advisory Board on Earth Sciences (MNABES). (14)	Ongoing biannually. (14)	ESS staff, clients, stakeholders and MNABES. (14)	Programs and services are effectively delivered in response to client requirements. (14)
Continue to support the development of the Resource Innovation Action Plan (RIAP), including the performance management framework and the management infrastructure for the RIAP. (14)	Implement the RIAP and support the RIAP management infrastructure. (14)	ESS stakeholders, clients and scientists. (14)	New technologies are developed in the natural resources sector. (14)
Coordinate input for and monitor progress of NRCan's Sustainable Development Strategy (SDS). (14)	Ongoing. (14)	ESS Sustainable Development Working Group and ESS stakeholders, including OGDs. (14)	ESS concerns are expressed in the department's SDS. (14)
Continue implementing and monitoring the ESS Management Improvement Plan. (16)	Ongoing. (16)	ESS management and staff. (16)	The effectiveness of Sector leadership activities increases. (16)

Objective 5.1: Leadership

Strategy 5.1.1: Strategic and Management Improvement Plans (continued)

		Performance Measures	
Support to MNABES in April and September 2000. (14) Reports on ESS progress in implementing the SDS. (14) Completion of planned Management Improvement Plan initiatives. (16)		Client feedback. (14)	Employee survey results. (16) Proportion of clients rating ESS services as "excellent". (14)

Objective 5.1: Leadership

Strategy 5.1.2: ESS Goals and Objectives

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Provide training on preparing ministerial briefing books and arranging ministerial events. (19)	Ongoing. (19) Revise guidelines, as needed. (19)	ESS management and staff, NRCan and the Minister of Natural Resources. (19)	An increased number of ESS ministerial events are held. (19) The profile of ESS within NRCan increases. (19) Awareness of the Sector's strategic direction, goals and objectives improves. (19)
		Performance Measures	
Number of presentations made. (19)	Results of the biannual employee survey and staff focus groups. (19)	Number of staff receiving training. (19)	Number of ministerial events held. (19) Assessments of internal communication. (19)

Objective 5.1: Leadership

Strategy 5.1.3: Organizational Culture

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Promote best practices and make the results of the best practices fora available to staff. (16,22)	Ongoing. (16,22)	ESS management and staff. (16)	Staff share ideas about best practices. (16)
Develop, and advise on, a comprehensive internal communications strategy that will ensure effective internal communication processes are established throughout the Sector. (19)	Implement the strategy. (19)	ESS management and staff. (19)	Internal communications improve. (19) The organizational culture improves. (19)
↑	↑ **Performance Measures** ↑		↑
Number of events scheduled. (19) Development of a Sector communications strategy. (19)		Attendance at the annual Best Practices Forum. (16)	Establishment of quality principles for the conduct of Sector business. (16) Availability of information to help management manage and improve all processes. (19)

Objective5.2: Human Resources: Foster an environment for Earth Sciences Sector staff to encourage employees to reach their full potential, participate in decision-making processes, and inspire staff to fulfill the Sector's goals and objectives.

Objective 5.2: Human Resources

Strategy 5.2.1: The 3Rs Strategy

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop and implement the Sector employment equity plan, and monitor its success in achieving its goals and objectives. (17,18)	Ongoing. (17,18)	ESS staff. (17,18)	Equity quotas are met and the workforce is representative of the Canadian population. (17,18)
Report on and monitor annual Sector strategic learning plans for employees. (17,18)	Ongoing. (17,18)	ESS staff. (17,18)	Employees develop skills and knowledge relevant to ESS requirements and a continuous learning organization. (17,18)
Report on and monitor annual Sector performance feedback reports for employees. (17,18)	Ongoing. (17,18)	ESS staff. (17,18)	Employee awareness of performance and improvement opportunities rises. (17,18)

Objective 5.2: Human Resources

Strategy 5.2.1: The 3Rs Strategy (continued)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Promote and coordinate the implementation of the Universal Classification Standard (UCS). (17,18)	Ongoing. (17,18)	ESS staff. (17,18)	All broad-banded position descriptions are converted to UCS. (17,18)
Implement the Sector exit questionnaire. (17,18)	Ongoing. (17,18)	Departing employees with more than three months of employment. (17,18)	Pertinent information for strategic recruitment is compiled. (17,18)
Monitor the Sector's commitment to spending two percent of its budget on new recruitment in strategic areas. (18)	Ongoing. (18)	ESS and new recruits, as per established targets. (18)	Capacity gaps and knowledge gaps are reduced, and the workforce is renewed. (18)
Establish Sector mentor and coaching programs. (18)	Ongoing. (18)	Program participants. (18)	Participants acquire managerial skills and knowledge. (18)
↑	↑ **Performance Measures** ↑		↑
Number of employment equity quotas established. (17,18)		Percentage of equity groups that have established quotas. (17,18)	Employment equity figures, by group. (17,18)
Reports on the development of learning plans. (17,18)		Percentage of employees who have learning plans (target is 100 percent). (17,18)	Completion of staff learning plans. (17,18)
Percentage of performance feedback reports completed. (17,18)		Percentage of employees providing performance feedback. (17,18)	Feedback from staff on level of awareness. (17,18)
Percentage of positions converted to the UCS. (17,18)		Percentage of ESS staff position descriptions converted to the UCS (target is 100 percent by 2001). (17,18)	Conversion of positions with minimal grievances. (17,18)
Number of exit questionnaires completed vs. number of departures. (17,18)		Number of departures. (17,18)	Use of information from exit questionnaires to improve the working environment. (17,18)
Percentage of Sector budget spent on recruitment in strategic areas. (18)		Meeting of recruitment targets. (18)	Number of positions filled, by strategic area. (18)
Establishment of mentoring and coaching programs. (18)		Enrollment figures in ESS mentoring and coaching programs. (18)	Number of participants successfully completing mentoring or coaching programs. (18)

Objective 5.2: **Human Resources**

Strategy 5.2.2: The STEP Program

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop and sponsor management development programs. (18)	Ongoing. (18)	ESS staff. (18)	Trainees develop skills in management and leadership. (18)
Promote the Scientific and Technical Exchange Program (STEP) both inside and outside ESS. (18)	Ongoing. (18)	ESS staff, STEP participants from the geoscience and geomatics communities, OGDs, universities, industry and the international community. (18)	Partnerships and collaboration with external sources increase. (18) ESS employees have developmental opportunities. (18)
Continue implementing the Geomatics Professional Development Program (GPDP). (18)	Ongoing. (18)	ESS, new recruits and external partners. (18)	GPDP graduates are sufficiently skilled to compete for jobs in their area of expertise. (18)
↑	↑	**Performance Measures** ↑	↑
Initiation of management development training programs. (18) Number of STEP agreements signed with partners. (18) Funding of 12 GPDP positions through WINS. (18)		Enrollment in management training programs. (18) Number of participants, by STEP program. (18) Number of GPDP participants and industry collaborators. (18)	Number of new managers qualified through management training programs by 2002. (18) Number of partnerships and collaborations with external sources. (18) Successful launch of all six components of STEP. (18) Continued participation of 22 candidates in the GPDP. (18)

Objective 5.2: Human Resources

Strategy 5.2.3: Employee Surveys

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Analyze the results of the 1999/2000 employee survey, develop recommendations and implement recommended actions. (16+ESS)	Conduct a Sector-wide employee survey in 2001/2002. (16+ESS)	ESS management and staff. (16)	Information is provided for decision-making. (16)
Listen to feedback from staff and conduct the Sector-wide employee survey. (16)	Ongoing. Conduct survey biannually. (16)	ESS management and staff. (16)	Managers obtain information to make improvements. (16) Relationships between ESS staff and management improve. (16)
Monitor Sector employee survey results. (18)	Ongoing biannually. (18)	ESS staff. (18)	Employees are satisfied. (18) Management practices improve. (18)
↑	↑ **Performance Measures** ↑		↑
Development of action plans for each ESS branch, centre and division, based on 1999/2000 survey results. (16) Development of action plans based on survey results. (18)	Number of survey questionnaires distributed. (16) Completion of the 2001/2002 employee survey. (16)	Percentage of staff responding to the survey. (16) Percentage of staff completing the survey. (16) Percentage of staff responding to surveys. (18)	Use of survey results to improve the working environment. (16) Implementation of recommendations and actions for improvement. (16) Number of survey ratings of less than 3. (16) Employee feedback. (18)

Objective 5.3: Clients and Stakeholders: Continue to align the deliverables of the Earth Sciences Sector with the needs and expectations of clients and stakeholders, as required and feasible.

Objective 5.3: Clients and Stakeholders

Strategy 5.3.1: Quality Systems

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Promote the use of the ESS Client Satisfaction Guidelines and provide related advice. (13)	Ongoing. (13)	ESS staff. (13)	Use of the Sector's Client Satisfaction Guidelines increases. (13)
Manage training related to measuring client satisfaction. (13,16)	Ongoing. (16)	ESS management and staff. (16)	The cost of conducting surveys is reduced. (16)
Conduct client and stakeholder surveys. (16)	Ongoing. (16)	Client and stakeholders. (16)	Client and stakeholder satisfaction levels are identified, as well as gaps and areas of overlap between surveys. (16)
Develop and deploy a more systematic measurement process. (16)	Ongoing. (16)	Sector employees, clients and stakeholders. (16)	A strategic approach to client satisfaction is established. (16)
Implement the ISO 9000 quality management system in the Mapping Services Branch (MSB). (16)	Ongoing. Implement ISO in other areas of ESS. (16)	MSB and Geodetic Survey Division staff, clients and stakeholders. (16)	Sector staff are capable of measuring client satisfaction. (16) All divisions of MSB obtain ISO registration by 2001. (16)
Help implement and manage the proposal-driven system for S&T in the GSC. (20)	Ongoing. (20)	GSC managers and staff. (20)	The focus and delivery of GSC S&T programs improve. (20)
↑	↑ **Performance Measures** ↑		↑
Number of client surveys conducted. (16) Number of client satisfaction measurement training sessions given to staff. (16)		Number of ESS employees receiving training in client satisfaction measurement techniques. (16) Number of ESS employees involved in the ISO registration process. (16)	Staff and client feedback. (13) Development of a quality management survey on customer satisfaction. (16) Number of reports of survey fatigue from clients (target is 0). (16) Cost of conducting surveys. (16) Number of areas ESS is considering for ISO registration. (16)

Objective 5.3: Clients and Stakeholders

Strategy 5.3.2: Networking with Stakeholders

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Convene the ESS International Business Coordination Committee. (13)	Ongoing. (13)	ESS representatives. (13)	The ESS International Business Strategy is implemented. (13)
Develop a strategic policy overview of federal, provincial and territorial cooperation in earth sciences. (14)	Ongoing. Maintain watching briefs. (14)	ESS staff, clients and stakeholders. (14)	Understanding of provincial and territorial earth science programs for policy and decision-making increases. (14)
Help develop collaborative approaches as determined through joint initiatives in geomatics (14) and geoscience (20).	Ongoing. (14,20)	Provincial and territorial earth science agencies, ESS clients and stakeholders. (14,20)	Federal and provincial programs remain relevant and focused. (14,20)
Seek new opportunities to collaborate and formalize new agreements. (14,20)	Ongoing. (14,20)	Provincial and territorial earth science agencies, ESS clients and stakeholders. (14,20)	Collaboration with provincial and territorial counterparts increases. (14,20)
Provide secretariat services to national earth sciences committee meetings and conferences, including the production of meeting reports, joint work on resolutions, and preparations for annual and biannual meetings. (14,20)	Ongoing. (14,20)	Canadian Council on Geomatics (CCOG), GeoConnections Management Board and the Mines Ministers' Conference. (14) The National Geological Surveys Committee, and the National Geoscience Mapping Program Steering Committee. (20)	Successful federal, provincial and territorial meetings are held. (14, 20) National earth sciences programs improve. (14, 20) Clients are satisfied. (14,20)
Provide reliable, timely, geoscience-related information on a range of issues. (14,20)	Ongoing. (14,20)	The Minerals and Metals Sector of NRCan and the Mines Ministers' Conference. (14,20)	Information to support sound economic, environmental and social decision-making is provided. (14,20)
Develop the Cooperative National Mapping Strategy and work toward renewing the Intergovernmental Geoscience Accord. (20)	Ongoing. (20)	ESS, provinces, territories and geoscience agencies. (20)	Federal-provincial cooperation in geoscience improves. (20)
Develop national geoscience policies and programs. (20)	Ongoing. (20)	ESS, provinces, territories, Canadian Council and the Canadian Council of Chairs of Earth Science Departments. (20)	Collaboration with the national geoscience community improves. (20)

Objective 5.3: Clients and Stakeholders

Strategy 5.3.2: Networking with Stakeholders (continued)

Performance Measures		
Number of new opportunities for collaboration identified. (14,20) Completion of 1999 Yellowknife meeting reports. (14) Completion of preparations for the CCOG 2000 annual meeting on schedule. (14)	Number of new joint planning agreements signed. (14,20)	Publication of a report on ESS international activities in 1999/2000 and a plan for ESS international activities in 2000/2001. (13) Number of formalized joint planning agreements in place with provinces and territories. (14,20) Client feedback. (14,20)

Objective 5.3: Clients and Stakeholders

Strategy 5.3.3: National and International Participation

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Participate in national and international discussions about memorandum of understanding (MOU) activities. (13)	Ongoing. (13)	The Canadian Institute of Geomatics, CCOG, GeoCan Information Solutions Inc., the Geomatics Industry Association of Canada and the International Cartographic Association. (13)	ESS visibility increases. (13) Knowledge is exchanged. (13)
Coordinate and prepare the GC and GSC annual reviews and publish them before September 30. (19)	Ongoing. (19)	Industry, OGDs, the geoscientific community, academia and parliamentarians. (19)	GC and GSC annual reviews are distributed promptly and effectively. (19)

Performance Measures		
Meeting of publication deadline. (19)	Number of reviews distributed, by user group. (19)	User feedback on annual reviews. (19)

Objective 5.3: Clients and Stakeholders

Strategy 5.3.4: Access to the ESS Information Infrastructure

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
No planned activities are identified for Year 1 of the planning period.			

Performance Measures		

Objective 5.3: Clients and Stakeholders

Strategy 5.3.5: Strategic Communications

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Coordinate National Science and Technology (S&T) week activities on behalf of NRCan. (19)	Ongoing. (19)	NRCan, the Minister of Natural Resources, ESS staff, OGDs, students, the public sector and the media. (19)	Awareness of earth science S&T and careers in geoscience increases, especially in government. (19)
Promote a comprehensive external communications strategy for ESS. (19)	Revise the strategy as required and continue to support implementation. (19)	The media, OGDs, parliamentarians and students. (19)	Awareness of ESS activities increases. (19) Awareness of earth sciences increases. (19)
↑	↑ **Performance Measures** ↑		↑
Number of promotional events organized and held. (19)		Attendance at internal and external S&T week events, including lectures. (19)	Number of hits on the ESS communications strategy web site. (19)
Number of S&T week activities organized. (19)		Number of NRCan sectors and OGDs participating in S&T week events. (19)	Number of requests for information received from students, and number of enquiries from academia, OGDs, parliamentarians and the public sector. (19) S&T week feedback (anecdotes, media coverage, surveys). (19)

Objective5.4: Suppliers and Partners: Develop relations with suppliers and partners, and leverage capacity.

Objective 5.4: Suppliers and Partners

Strategy 5.4.1: Developing Partnerships

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Work with suppliers and partners on issues of common concern, using shared standards and emerging technologies. (14,22)	Ongoing. (14)	ESS staff, clients, OGDs and central agencies. (14)	Service delivery and interdepartmental coordination improve. (14) ESS relations with other federal departments are strengthened. (14)
Promote the development of partnerships for STEP and GPDP. (18)	Ongoing. (18)	The geoscience and geomatics communities, OGDs, universities, industry, the Natural Sciences and Engineering Research Council of Canada, and the international community. (18)	Partnerships and collaboration with external sources of funding increase. (18)
↑	↑ **Performance Measures** ↑		↑
Number of promotional events attended. (18)		Relations with targeted departments on key issues. (14) Number of partnerships established. (18)	Client feedback about the timeliness of responses. (14) Total funds leveraged. (18)

Objective 5.4: Suppliers and Partners

Strategy 5.4.2: User Access to Information and Services

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
No planned activities are identified for Year 1 of the planning period.			
↑	↑ **Performance Measures** ↑		↑

Objective5.4: Suppliers and Partners

Strategy 5.4.3: Access to Facilities

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop and maintain mutually beneficial partnerships with other agencies and the private sector. (1-7)	Ongoing. (1-7)	Other federal and provincial agencies and academia. (1-7)	Geoliteracy increases. (1-7)
Establish reference rooms for collaborative NATMAP projects. (4,22)	Implement spatial searches, facilitate construction of "branch holdings" and link with cross-disciplinary libraries. (4,22)	Beneficiaries The geoscience community and the public sector. (4) Clients Policy makers, the Yukon Geoscience Office and Environment Canada. (4) Partners BCGS, other GSC divisions, UBC, and the USGS. (4)	The client base for use of geoscience information is expanded. (4) Geoscience holdings for western Canada are fully linked and easily accessible. (4)
Host university professors on sabbatical leave. (10)	Ongoing. (10)	University professors. (10)	Scientific capacity increases. (10)
↑	↑ **Performance Measures** ↑		↑
Number of university professors hosted at CCRS. (10)			Feedback from the public sector about the accessibility and utility of geoscience information. (1-7)

Objective5.4: Suppliers and Partners

Strategy 5.4.4: Supplier Relations

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Implement an automated procurement system by 2001. (18)	Ongoing. (18)	ESS staff engaged in procurement. (18)	The system is in place. (18)
Procure goods and services as per established and revised policies. (18)	Ongoing. (18)	Geomatics and ESS Corporate staff. (18)	Goods and services are procured at the lowest possible cost. (18)
↑	↑ **Performance Measures** ↑		↑
Meeting of implementation target. (18)		Number of employees trained to use the automated procurement system. (18) Number of users accessing the system. (18)	Successful use of the automated procurement system. (18) Successful use of system for responding to Access to Information Program (ATIP) requests. (18)

Objective 5.5: Planning: Align the Earth Sciences Sector's planning activities and practices for its programs and their delivery with its strategic goals and priorities.

Objective 5.5: Planning

Strategy 5.5.1: Business Planning

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Produce the Sector Business Plan by March 31. (13)	Ongoing. (13)	ADM, and ESS branches, centres and divisions. (13)	Awareness of the operation of ESS increases. (13)
Review branch, centre and division business plans, as well as mid-year and year-end reviews. (13)	Ongoing. (13)	ADM, ESS staff, and ESS clients and stakeholders. (13)	Business plans improve. (13) Accountability improves. (13)
↑	↑ **Performance Measures** ↑		↑
Meeting of production and review deadlines for business plans. (13)		Number of Sector business plans distributed. (13) Number of intranet web site hits. (13)	Staff and client feedback on plans and reviews. (13)

Objective 5.5: Planning

Strategy 5.5.2: The Proposal-driven Sector Project System (SPS)

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Implement the funding process using PROGRID®. (20)	Ongoing. (20)	ADM, ESS staff, clients, and stakeholders. (20)	A standardized funding process, aligned with ESS goals, is established. (20)
Review the process and recommend improvements. (20)	Ongoing. Implement approved recommendations. (20)		The performance of ESS S&T is improved. (20)
↑	↑	**Performance Measures** ↑	↑
Implementation deadline is met. (20) Recommended improvements are made. (20) Number of projects reviewed using PROGRID®. (20)		Number of ESS project managers using the PROGRID® process. (20)	Feedback received attesting to the benefits of the PROGRID® process. (20)

Objective 5.5: Planning

Strategy 5.5.3: Project Management Standards

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Maintain the Sector Project System (SPS). (14,22)	Upgrade the SPS in response to client requirements. (14,22)	ESS project managers. (14)	Project information is readily available to clients for decision-making. (14)
Help implement Sector-wide criteria for project management. (14)	Ongoing. (14+ESS)	ESS management and staff, clients and stakeholders. (14)	Project management tools are provided. (14)
↑	↑	**Performance Measures** ↑	↑
Implementation of Sector-wide criteria for project management. (14)		Internal feedback about SPS. (14)	Client feedback about SPS. (14)

Objective 5.6: Process Management: Improve effective and efficient administration and processes for delivering programs, products and services.

Objective 5.6: Process Management

Strategy 5.6.1: Modernization of Comptrollership

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Promote the Financial Information Strategy (FIS) and modernization of comptrollership initiatives within ESS. (18)	Ongoing. (18)	ESS financial staff and managers. (18)	Modernized comptrollership and FIS are introduced into ESS. (18)
Support the financial management of the Revolving Fund (RF). (18)	Ongoing. (18)	RF project managers. (18)	The RF is administered successfully. (18)
Implement an automated information management system. (18, 22)	Ongoing. (18,22)	ESS staff. (18)	The system is in place. (18)
Obtain ISO 9000 certification for Technical Field Support Services (TFSS). (18)	Maintain certification. (18)	ESS staff that use TFSS services and ISO. (18)	A consistent process is in place to ensure certification and continued success. (18)
↑	↑ **Performance Measures** ↑		↑
Quantity of information disseminated internally about the modernization of comptrollership. (18)		Number of information sessions given and number of managers informed. (18)	Percentage of managers informed about modernization of comptrollership methods. (18)
Number of RF projects supported. (18)		Number of project managers receiving support. (18)	Maintenance of the RF. (18)
Introduction of an automated information retention system. (18,22)		Percent of TFSS staff trained in ISO certification. (18)	Renewal of ISO certification. (18)
Obtaining of ISO certification for TFSS by 2000/2001. (18)		Number of actions issued by quotes or standing offers. (18)	Operating costs. (18)
Percentage of purchasing compliant with established and revised policies. (18)			

Objective 5.6: Process Management

Strategy 5.6.2: Common Sector Business Practices

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Develop, review and administer written agreements. (13)	Ongoing. (13)	ESS clients and ESS project managers. (13)	Consistency in business agreements is achieved and risks to the Crown are reduced. (13)
Establish and publish the ESS price list by April 1. (13)	Ongoing. (13)	ESS staff and clients. (13)	One price list for all ESS products and services is published. (13)
Provide timely and strategic information on Cabinet and parliamentary processes. (14)	Provide timely and strategic information on Cabinet and parliamentary processes. (14)	ESS staff, clients and stakeholders. (14)	Responses to Cabinet requests improve. (14) Information is shared in a timely and appropriate way. (14)
Facilitate the conduct of self-assessments within ESS. (16)	Ongoing. (16)	ESS management, clients and stakeholders (16)	
Implement actions to close gaps in how the Management Framework is being applied and conduct reassessments. (16+ESS)	Ongoing. (16+ESS)	ESS management, clients and stakeholders (16)	Management improvement plans are developed. (16)
↑	↑ **Performance Measures** ↑		↑
Deadlines for reviewing agreements are met. (13) Gaps in how the Management Framework is being applied are identified. (16+ESS)		Number of agreements signed. (13) Client and stakeholder feedback regarding timeliness of information. (14)	Number of agreements that result in complaints against the Crown. (13) Feedback from the minister's office. (14) Identified gaps are closed. (16)

Objective 5.6: Process Management

Strategy 5.6.3: Management of the Revolving Fund

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Manage the RF. (13)	Ongoing. (13)	RF Committee and RF project managers. (13)	The RF is well managed and maintained. (13)
↑	↑ **Performance Measures** ↑		↑
Number of new and renewed RF projects reviewed. (13)			Balancing of RF expenditures and revenue generation. (13)

Objective 5.6: Process Management

Strategy 5.6.4: Trends and Opportunities

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Incorporate the advice of MNABES in sector planning and priority-setting. (14+ESS)	Ongoing. (14+ESS)	ESS staff, clients and stakeholders. (14)	Program direction is strengthened. (14)
↑	↑ **Performance Measures** ↑		↑
Meeting of publication deadline. (13)		Client and stakeholder feedback regarding timeliness of information. (13)	Feedback from the minister's office. (14)

Objective 5.7: Performance Reporting: Report on performance in delivery of programs, products and services, for accountability to all clients, in support of continuous improvement.

Objective 5.7:	**Performance Reporting**
Strategy 5.7.1:	Internal and External Reviews
Strategy 5.7.2:	Impact Studies

Year 1 Deliverables	Years 2 and 3 Deliverables	Reach	Short- and Long-term Results
Conduct at least one internal audit of Sector business practices. (13)	Ongoing. (13)	ESS management and staff. (13)	Information for decision-making is provided. (13) ESS business practices are improved. (13)
Support socio-economic impact studies of ESS activities. (13,14)	Ongoing. (13,14)	ESS branches, centres and divisions, and ESS clients and stakeholders. (13,14)	Information for program direction and focus is provided. (13,14)
Help develop and implement impact assessments in ESS. (14+ESS) Communicate impact assessment results to target audiences. (14+ESS)	Ongoing. (14+ESS)	ESS staff, clients and stakeholders, including central agencies, OGDs, parliamentarians and the public sector. (14)	Awareness of the relevance and socio-economic impact of ESS programs and services increases. (14)
Review major ESS S&T programs (target is one per year). (20)	Ongoing. (20)	ESS clients and stakeholders. (20)	The delivery of ESS S&T programs improves. (20)
Conduct a Sector health and safety evaluation. (18)	Monitor actions taken as a result of the evaluation. (18)	ESS staff. (18)	Continuous improvement and compliance for a safe working environment are maintained. (18)
Implement the upgrades recommended during the evaluation of laboratories at 601 Booth Street. (18)	Complete upgrades as necessary. (18)	ESS staff. (18)	The working environment and laboratory facilities at 601 Booth Street are improved. (18)
↑	↑ **Performance Measures** ↑		↑
Meeting of audit target. (13) Meeting of review target. (14) Completion of the Sector's health and safety evaluation. (18) Percentage of upgrades completed. (18)		Feedback from ESS staff, clients, central agencies, OGDs, parliamentarians and the public sector. (14) Percentage of ESS facilities evaluated (target is 100 percent). (18)	Use of review information to improve business practices. (13) Use of study recommendations to make management decisions. (13) Stakeholder feedback on ESS S&T programs. (14) Percentage compliance with health and safety guidelines, as compared to previous year's results. (18) Feedback from users of laboratory facilities at 601 Booth Street. (18)

4 Earth Sciences Sector: Management Plan

ESS operates with a quality management philosophy in order to be an effective organization striving to provide excellent service to clients, to be a better place to work and to provide good value to the Canadian taxpayer. In accordance with this philosophy, the Sector has adopted the following management principles:

- a primary focus on clients;
- leadership through involvement and example;
- cooperation, teamwork and partnering;
- respect for the individual and encouragement for people to develop to their full potential;
- recognition of the importance of the contribution of each and every individual;
- commitment to process-oriented, prevention-based strategy;
- the continuous improvement of methods and results;
- a fact-based approach to decision-making;
- a responsibility to stakeholders and to society; and
- the application of the principles of modern comptrollership.

Management Framework

The Sector has developed a framework that helps it maintain and develop the tools and practices it needs to manage itself according to its principles. The framework reflects NRCan's *Guide to Good Management* and is composed of these principal elements:

- leadership and planning;
- clients and stakeholders;
- process improvement;
- human resources;
- suppliers and partners; and
- Sector results and performance.

Management Improvement Processes

The ESS Management Framework helps the Sector develop its annual Management Improvement Plan. The Sector has implemented a number of processes to monitor progress and ensure the relevance of this plan.

These processes include the following events.

- At the annual Sector management retreat, data from many sources—including the strategic overview, departmental priorities, the employee survey, upward feedback, NRCan audit and evaluation assessments, organizational self-evaluation and client feedback—are analyzed and used to assess progress made according to the ESS Management Framework and to identify areas for improvement.

  Milestones: fall 2000, 2001 and 2002.

- Each Sector Management Team (SMT) member presents a semiannual report on progress made in his or her own area. Reports on quality projects carried out by each division are posted on the Internet twice per year.

  Milestones: mid-year and year-end reviews in 2000/2001, 2001/2002 and 2002/2003.

- An annual forum encourages divisions and branches to exchange best management practices.

  Milestones: spring 2000, 2001 and 2002.

- Organizational self-assessments are conducted to validate progress and to identify potential improvements. These involve employees at all levels of the organization.

  Milestones: March and April 2000, and March and April 2001.

Management Improvement Plan Initiatives for 2000/2001

Vision and Strategic Direction

Building on the data gathered from various surveys, as well as the ESS Science and Technology (S&T) Capacities Study, SMT members will analyze Sector priorities and ensure the Sector's vision and activities are aligned with NRCan objectives.

Accountability: All SMT members.

Internal Communications

Internal communications are a priority for ESS management. A communications plan will be developed and implemented to articulate the Sector's vision and strategic direction. The Task Force on Communications has been struck to identify, develop and deploy improved communications processes for the Sector.

Accountability: SMT and members of the Task Force on Communications.

Management will continue to meet with staff to communicate departmental management committee and SMT meeting highlights. There will be two Sector management staff meetings and a best practices meeting during the year. The Assistant Deputy Minister will also meet with employees in all divisions, including regions, during 2000/2001.

Accountability: All SMT members.

Stakeholder and Customer Satisfaction

ESS will continue to identify client and stakeholder satisfaction levels and to develop and deploy a more systematic measurement process. The measurement process may identify options and opportunities for improving products and processes.

During 1998/1999, ESS Business Development Office prepared and distributed *Guidelines for Client Satisfaction Measurement Activity* in ESS. Working with the Business Development Office, the Sector Quality Management Advisor (SQMA) will manage training related to measuring client satisfaction, which is planned for 2000/2001.

Accountability: SQMA, the Executive Director and Business Development Office managers, under the guidance of SMT members.

Employee Satisfaction and Employee Surveys

ESS and Treasury Board conducted employee satisfaction surveys that identified opportunities for improvement at the Sector, branch and division levels. Managers and staff have developed improvement plans based on this information. Staff and managers will carry out the specific and general actions indicated in these improvement plans. At the Sector level, the Human Resources Task Force on Fairness will develop options that managers can use to address the perceived fairness issues in the employee survey. Individual branches and divisions have developed specific action items.

Accountability: All SMT members.

Information Management

The project information system will be refined as it is implemented throughout the Sector. The Sector will continue to develop and provide training and support in project management tools and techniques related to the Sector Project System.

Accountability: All SMT members, the Policy, Planning, Information Services Branch, and project managers.

Service Standards

During 1999/2000, the final report of the NRCan audit of external service standards was completed and a number of recommendations were implemented, including the update of the existing standards. The remaining recommendations from the audit report will be implemented in 2000/2001.

Accountability: Executive Director, Business Development Office.

Scientific Review and Assessment

ESS has established a process and a schedule for external scientific review and assessment. In 2000/2001, impact studies of the GSC Hydrocarbons Program will be completed.

Accountability: Chief Geoscientist.

Process Management

ESS will continue implementing ISO 9000 quality management systems in the Mapping Services Branch (MSB). An ISO system is also being developed for the Geodetic Survey Division (GSD).

Accountability: Director General, MSB and Director, GSD.

Management Skills Development

ESS will continue to provide skills training to managers and potential managers by offering courses on managing performance. The Sector will also support government-wide and departmental human resource efforts.

Accountability: SMT members.

ANNEX A:

Earth Sciences Sector Organization Chart

Natural Resources Canada

Minister
Ralph Goodale

Deputy Minister
Peter Harrison

Earth Sciences Sector

Assistant Deputy Minister
Marc Denis Everell

Senior Advisor Communications
Robin Riddihough

ESS Communications Head
Vacant

ADM's Office
Executive Assistant to the ADM
Judith Boucher

Chief Geoscientist
Richard Grieve

Human Resources Advisor
Marielle Doyon

Quality Management Advisor
Larry Taylor

Sector Financial Advisor
Réjean Langlais

Corporate Services

Policy, Planning, Information and Services Branch
Director General
Susan Till

Policy, Planning and Coordination Division
Director
Vacant

Geoscience Information Division
Director
Annette Bourgeois

Management and Administrative Services
Director
Marielle Doyon

Business Development Office
Executive Director
David Carney

Business Management
Director
David Reade

Business Relations
Director
Gordon Plunkett

Polar Continental Shelf Project

Polar Continental Shelf Project
Executive Director
Bonni Hrycyk

Geological Survey of Canada

Sedimentary & Marine Geoscience Branch
Director General
Richard Haworth

SMGB
Associate Director General
Jean-Serge Vincent

GSC Atlantic
Director
Jacob Verhoef

GSC Calgary
Director
Grant Mossop

GSC Quebec
Director
Aicha Achab

Terrain Sciences Division
Director
Paul Egginton

Minerals & Regional Geoscience Branch
Director General
Murray Duke

Continental Geoscience Division
Director
David Boerner

Mineral Resources Division
Director
John Wood

GSC Pacific
Director
Sandy Colvine

Geomatics Canada

Legal Surveys and International Boundary Commission
Surveyor General
Michael O'Sullivan

Corporate Services
Head
Richard Garber

Regulations
Head
Jean Gagnon

Eastern Region
Deputy Surveyor General
Doug Culham

Northwest Territories and Nunavut Regional Office
Deputy Surveyor General
Lorne McNeice

Western Region
Deputy Surveyor General
Gord Olsson

Yukon Territory Regional Office
Deputy Survey General
Bob Gray

Geodetic Survey Division
Director
Denis Hains

Gravity and Geodetic Networks
Chief
Robert Duval

Active Control Systems
Chief
Norman Beck

Client Services

Geodetic Information Technology Unit

International Boundary Commission
Engineer
Noel Paquette

Mapping Services Branch
Director General
François Faucher

Data Acquisition (Sherbrooke)
Director
Yves Belzile

Data Acquisition (Ottawa)
A/Director
Daniel Pelletier

Products & Client Services (Sherbrooke)
Director
Denis De Gagné

Products & Client Services (Ottawa)
Director
Patrice Furlong

Aeronautical and Technical Services
Director
Paul LaRose

Canada Centre for Remote Sensing
Director General
Edryd Shaw

Applications Division
Director
Ron Brown

GeoAccess Division
Director
Bob O'Neil

Data Acquisition Division
Director
Florian Guertin

Technology Assessment Division
Director
Les Whitney

ANNEX B:

Directory of Earth Sciences Sector Offices

Geomatics Canada

Geodetic Survey Division

615 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 992-2656
Fax: (613) 947-3602

Legal Surveys Division and the International Boundary Commission

Legal Surveys Division
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 995-4341
Fax: (613) 992-1122

International Boundary Commission
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 992-1294
Fax: (613) 947-1337

Eastern Regional Operations Centre (EROC)
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 995-2604
Fax: (613) 995-2612
Cellular: (613) 851-7115
Conference Room: (613) 995-7606

Atlantic Client Liaison Unit
136 Victoria Street East
Amherst, Nova Scotia B4H 1Y1
Telephone: (902) 661-6766
Fax: (902) 661-6769
Cellular: (902) 664-8482

Ontario Client Liaison Unit
55 St. Clair Avenue East, Suite 606
Toronto, Ontario M4T 1M2
Telephone: (416) 973-1006
Fax: (416) 973-1004
Cellular: (416) 574-9418

Quebec Client Liaison Unit
320 St. Joseph East
Box 51127—G. Roy
Quebec, Quebec G1K 8Z7
Telephone: (418) 648-5725
Fax: (418) 648-5728
Cellular: (418) 655-4656

Northwest Territories and Nunavut Regional Office
4920 52nd Street, 4th Floor
Box 668
Yellowknife, Northwest Territories X1A 2N5
Telephone: (867) 669-3949
Fax: (867) 920-6662
Computer: (867) 669-3915
Boardroom: (867) 669-3905

Yukon Regional Office
300 Main Street, Room 225
Whitehorse, Yukon Y1A 2B5
Telephone: (867) 667-3957
Fax: (867) 393-6709

Nunavut Client Liaison Unit
5102—50th Avenue, Room 202
Yellowknife, Northwest Territories X1A 3S8
Telephone: (867) 669-2901
Fax: (867) 669-2930

Western Regional Operations Centre (WROC)
9700 Jasper Avenue, Suite 605
Edmonton, Alberta T5J 4C3
Telephone: (780) 495-2138
Fax: (780) 495-4052

Alberta Client Liaison Unit
9700 Jasper Avenue, Suite 605
Edmonton, Alberta T5J 4C3
Telephone: (780) 495-6174
Fax: (780) 495-4052

Saskatchewan Client Liaison Unit
100 Central Park Place
2208 Scarth Street
Regina, Saskatchewan S4P 2J6
Telephone: (306) 780-5402
Fax: (306) 780-5191
Records: (306) 780-6992

British Columbia Client Liaison Unit
1550 Alberni Street, Suite 800
Vancouver, British Columbia V6G 3C6
Telephone: (604) 666-5326
Fax: (604) 666-0522

Manitoba Client Liaison Unit
275 Portage Avenue, Suite 501
Winnipeg, Manitoba R3B 2B3
Telephone: (204) 983-3793
Fax: (204) 983-0157

Manitoba Indian and Northern Affairs Canada Land Claims Client Liaison Unit
275 Portage Avenue, Suite 501
Winnipeg, Manitoba R3B 2B3
Telephone: (204) 983-3623
Fax: (204) 984-5828

Canada Centre for Remote Sensing
588 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0Y7
Telephone: (613) 947-1222
Fax: (613) 947-1382

GeoAccess Division
615 Booth Street, 6th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 947-1245
Fax: (613) 947-2410

Technology Assessment Division
588 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0Y7
Telephone: (613) 947-1211
Fax: (613) 947-3125

Applications Division
588 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0Y7
Telephone: (613) 947-1263
Fax: (613) 947-1385

Data Acquisition Division
588 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0Y7
Telephone: (613) 947-1356
Fax: (613) 943-8201

Mapping Services Branch

615 Booth Street, 7th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 947-0793
Fax: (613) 995-2000

Centre for Topographic Information (Sherbrooke)
2144 King Street West, Suite 010
Sherbrooke, Quebec J1J 2E8
Telephone: (819) 564-5600
Fax: (819) 564-5698
Toll-free Telephone: (800) 661-2638

National Air Photo Library
615 Booth Street, 1st Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 995-4560
Fax: (613) 995-4568
Toll-free Telephone: (800) 230-6275

Aeronautical and Technical Services
615 Booth Street, 1st Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 992-4456
Fax: (613) 943-8959

Centre for Topographic Information (Ottawa)
615 Booth Street, 7th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 995-4921
Fax: (613) 947-7948

Canada Map Office
130 Bentley Road
Nepean, Ontario K2E 6T9
Telephone: (613) 952-7000
Toll-free Telephone: (800) 465-6277
Fax: (613) 957-8861
Toll-free Fax: (800) 661-6277

Geological Survey of Canada

601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-3919
Fax: (613) 996-9990
E-mail: library@gsc.nrcan.gc.ca

Sedimentary and Marine Geoscience Branch

601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-2340
Fax: (613) 996-6575
E-mail: info-ottawa@gsc.nrcan.gc.ca

Terrain Sciences Division
601 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4938
Fax: (613) 992-0190
E-mail: info-ottawa@gsc.nrcan.gc.ca

GSC Atlantic
Geological Survey of Canada (Atlantic)
Bedford Institute of Oceanography
Box 1006, Challenger Drive
Dartmouth, Nova Scotia B2Y 4A2
Telephone: (902) 426-3225
Fax: (902) 426-1466
E-mail: info-dartmouth@gsc.nrcan.gc.ca

Minerals and Regional Geoscience Branch

601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4093
Fax: (613) 996-6575

Continental Geoscience Division
601 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4314
Fax: (613) 995-7322

Mineral Resources Division
601 Booth Street, 6th Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-9223
Fax: (613) 992-5694

GSC Pacific
Geological Survey of Canada (Pacific)
9860 West Saanich Road
Sidney, British Columbia V8L 4B2
Telephone: (250) 363-6438
Fax: (250) 363-6500

Sedimentary and Marine Geoscience Branch (continued)

GSC Calgary
Geological Survey of Canada (Calgary)
3303-33rd Street N.W.
Calgary, Alberta T2L 2A7
Telephone: (403) 292-7000
Fax: (403) 292-5377
E-mail: info-calgary@gsc.nrcan.gc.ca

GSC Quebec
Geological Survey of Canada (Quebec)
2535 Laurier Boulevard
Box 7500
Sainte-Foy, Quebec G1V 4C7
Telephone: (418) 654-2604
Fax: (418) 654-2615
E-mail: info-stefoy@gsc.nrcan.gc.ca

Pacific Geoscience Centre–Western Canada National Earthquake Hazards
9860 West Saanich Road
Box 6000
Sidney, British Columbia V8L 4B2
Telephone: (250) 363-6500
Fax: (250) 363-6739
E-mail: pgcinfo@pgc.nrcan.gc.ca

Cordilleran Geosciences
101- 605 Robson Street
Vancouver, British Columbia V6B 5J3
Telephone: (604) 666-0529
Fax: (604) 666-1124
E-mail: gscvan@gsc.nrcan.gc.ca

Map and Publication Sales
Telephone: (604) 666-0271
Fax: (604) 666-1337

Geoscience Research Library
Telephone: (604) 666-3812
Fax: (604) 666-7186

Pacific Geoscience Centre–Eastern Canada National Earthquake Hazards
7 Observatory Crescent
Ottawa, Ontario K1A 0Y3
Telephone: (613) 995-5593
Fax: (613) 992-8836
E-mail: info@seismo.nrcan.gc.ca

National Geomagnetism
2617 Anderson Road
Gloucester, Ontario K1G 3N5
Telephone: (613) 837-4241
Fax: (613) 824-9803
E-mail: coles@geolab.nrcan.gc.ca

Polar Continental Shelf Project

615 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 947-1601
Fax: (613) 947-1611

Corporate Services

Assistant Deputy Minister's Office
580 Booth Street, 14th Floor
Ottawa, Ontario K1A 0E4
Telephone: (613) 992-9983
Fax: (613) 992-8874

Chief Geoscientist Office
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-5372
Fax: (613) 996-8059

Policy, Planning, Information and Services Branch
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-9551
Fax: (613) 943-8296

Senior Advisor (Communications)
580 Booth Street, 14th Floor
Ottawa, Ontario K1A 0E4
Telephone: (613) 947-2789
Fax: (613) 992-8874

Senior Advisor (ResSources)
580 Booth Street, Room 200
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4089
Fax: (613) 996-8748

Senior Communications Manager
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4261
Fax: (613) 995-3082

Human Resources Advisor
601 Booth Street, 1st Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4215
Fax: (613) 947-0146

Sector Financial Advisor Office
615 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 995-0842
Fax: (613) 992-3657

Quality Management Advisor
580 Booth Street, 14th Floor
Ottawa, Ontario K1A 0E4
Telephone: (613) 947-7353
Fax: (613) 992-8874

Business Development Office
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 996-0441
Fax: (613) 995-8737

Earth Sciences Information Centre
601 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-3919
Fax: (613) 943-8742
E-mail: library@nrcan.gc.ca

ANNEX C: List of Acronyms

4NR	Four federal national resources departments: Natural Resources Canada, Agriculture and Agri-Food Canada, Department of Fisheries and Oceans, and Environment Canada
5NR	4NR plus Health Canada
AAFC	Agriculture and Agri-Food Canada
ACLS	Association of Canada Lands Surveyors
ADM	Assistant Deputy Minister
AECL	Atomic Energy of Canada Limited
ATCO	Alberta Trailer Company (large multi-national resource company)
ATS	Aeronautical and Technical Services
BCGS	British Columbia Geological Survey
CACS	Canadian Active Control System
CAMIRO	Canadian Mining Industry Research Organization
CBN	Canadian Base Network
CCAF	Climate Change Action Fund
CCOG	Canadian Council on Geomatics
CCOP	Coordinating Committee for Coastal and Offshore Geoscience Programs in East and Southeast Asia
CCRS	Canada Centre for Remote Sensing
CEAA	Canadian Environmental Assessment Agency
CEONet	Canadian Earth Observation Network
CFS	Canadian Forest Service
CGDI	Canadian Geospatial Data Infrastructure
CGKN	Canadian Geoscience Knowledge Network
CGNDB	Canadian Geographical Names Data Base
CIDA	Canadian International Development Agency
CIG	Canadian Institute of Geomatics
CLS	Canada Lands Surveyor
CLSS	Canada Lands Survey System
C-NGO	Canada-Nunavut Geoscience Office
COPA	Canadian Owners and Pilots Association
CORDLink	Cordillera Link
COSO	Committee of Senior Officials
CPCGN	Canadian Permanent Committee on Geographical Names
CRESTech	Centre for Research for Earth and Space Technology
CSA	Canadian Space Agency

CSRS	Canadian Spatial Reference System
CSTA	Committee of Science and Technology Advisors
CTBTO	Comprehensive Test Ban Treaty Organization
CTI	Centre for Topographic Information
Cu-Ni-PGE	Copper-nickel-platinum group elements
DFAIT	Department of Foreign Affairs and International Trade
DFO	Department of Fisheries and Oceans
DND	Department of National Defence
DSI	Downhole Seismic Imaging
EC	Environment Canada
EPC	Emergency Preparedness Canada
EO	Earth observation
ESIC	Earth Sciences Information Centre
ESS	Earth Sciences Sector
EXTECH	Exploration Science and Technology Program
FIS	Financial Information Strategy
FNERP	Federal Nuclear Emergency Response Plan
FSWEP	Federal Student Work Experience Program
GC	Geomatics Canada
GCOS-WMO	Global Climate Observing System—World Meteorological Organization
GEOIDE	Geomatics for Informed Decisions
GEOTOP	A consortium of geomatics companies
GEUS	Geological Survey of Denmark and Greenland
GHG	Greenhouse gas(es)
GIAC	Geomatics Industry Association of Canada
GIMS	Geoenvironmental Information Management System
GIS	Geographic information system
GPDP	Geomatics Professional Development Program
GPS	Global Positioning System
GSC	Geological Survey of Canada
GSD	Geodetic Survey Division
HC	Health Canada
HRDC	Human Resources Development Canada
HROU	Human Resources Operations Unit
HYDROLINK	An alliance of four world-class organizations created to provide hydrographic and bathymetric products and services.
IC	Industry Canada
ICA	International Cartographic Association
IERS	International Earth Rotation Service
IFR	Instrument Flight Rules

IGB	International Gravity Bureau
IgeS	International Geoid Service
IGS	International GPS Service
IHP-UNESCO	International Hydrological Programme—United Nations Educational, Scientific and Cultural Organization
IMS	International Monitoring System
INAC	Indian and Northern Affairs Canada
INRS	Institute national de la recherche scientifique
IPCC	Intergovernmental Panel on Climate Change
ISO	International Standards Organization
ITRF	International Terrestrial Reference Frame
IVS	International VLBI Service
JNOC	Japan National Oil Company
Landsat-7	Earth observation satellite
LOS	Law of the Sea
LSD	Legal Surveys Division
MADONA	Magnetic Anomaly Database of North America
MDA	MacDonald Dettwiler & Associates
MEM	Digital Marine Electromagnetic System
MERA	Mineral Review and Evaluation Assessment
MGSB	Manitoba Geological Services Branch
MIP	Management Improvement Plan
MITE	Metals in the Environment
MNABES	Minister's National Advisory Board on Earth Sciences
MOU	Memorandum of Understanding
MRN	Ministère des Ressources naturelles
MSB	Mapping Services Branch
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration
NATMAP	National Geoscience Mapping Program
NCE	Network of Centres of Excellence
NGO	Non-governmental organizations
NGR	National Geochemical Reconnaissance
NRC	National Research Council Canada
NRCan	Natural Resources Canada
NSD	Nunavut Department of Sustainable Development
NSERC	Natural Sciences and Engineering Research Council
NTDB	National Topographic Data Base
NTS	National Topographic Series
ODP	Ocean Drilling Program
OEA	Office of Environmental Affairs
OECD	Organisation for Economic Cooperation and Development

OGD	Other government department
OGS	Ontario Geological Survey
OPG	Ontario Power Generation
PARC	Prairie Adaptation Research Cooperative
PCSP	Polar Continental Shelf Project
PEP	Professional Enhancement Program
PFRA	Prairie Farm Rehabilitation Administration
PPISB	Policy, Planning, Information and Services Branch
R&D	Research and development
RF	Revolving Fund
RIAP	Resource Innovation Action Plan
SAR	Synthetic Aperture Radar
SCI	Sustainable Communities Initiative
SDME	Saskatchewan Department of Mines and Energy
SDS	Sustainable Development Strategy
SEDEX	Sedimentary Exhalative
S&T	Science and technology
SFAO	Sector Financial Advisor Office
SHRIMP	Sensitive High-resolution Ion Microprobe
SMT	Sector Management Team
SMERAC	Senior Mineral and Energy Resource Assessment Committee
SNORCLE	Slave–Northern Cordillera Lithosphere Evolution
SOPAC	South Pacific Applied Geoscience Commission
SPS	Sector Project System
SQMA	Sector Quality Management Advisor
SRC	Saskatchewan Research Council
STEP	Science and Technology Enhancement Program
STRATCOM	Sector Strategic Communications Committee
TFSS	Technical Field Support Services
TBS	Treasury Board of Canada, Secretariat
UBC	University of British Columbia
UCS	Universal Classification Standard
USGS	United States Geological Survey
VFR	Visual Flight Rules
VMS	Volcanogenic Massive Sulphides
VLBI	Very Long Baseline Interferometry
VMAP	Vector Map
WCSB	Western Canada Sedimentary Basin
WINS	Winning in the Knowledge-based Economy